Osborne

Foreword by Satish Gupta, Media Vision's Vice President of Strategic Marketing and Development

PRO AUDIO 16

The Only Official Book

MEDIA VISION

THE OFFICIAL BOOK

INCLUDES HIGH DENSITY 3.5" DISK

By Ivan Luk and David M. Golden

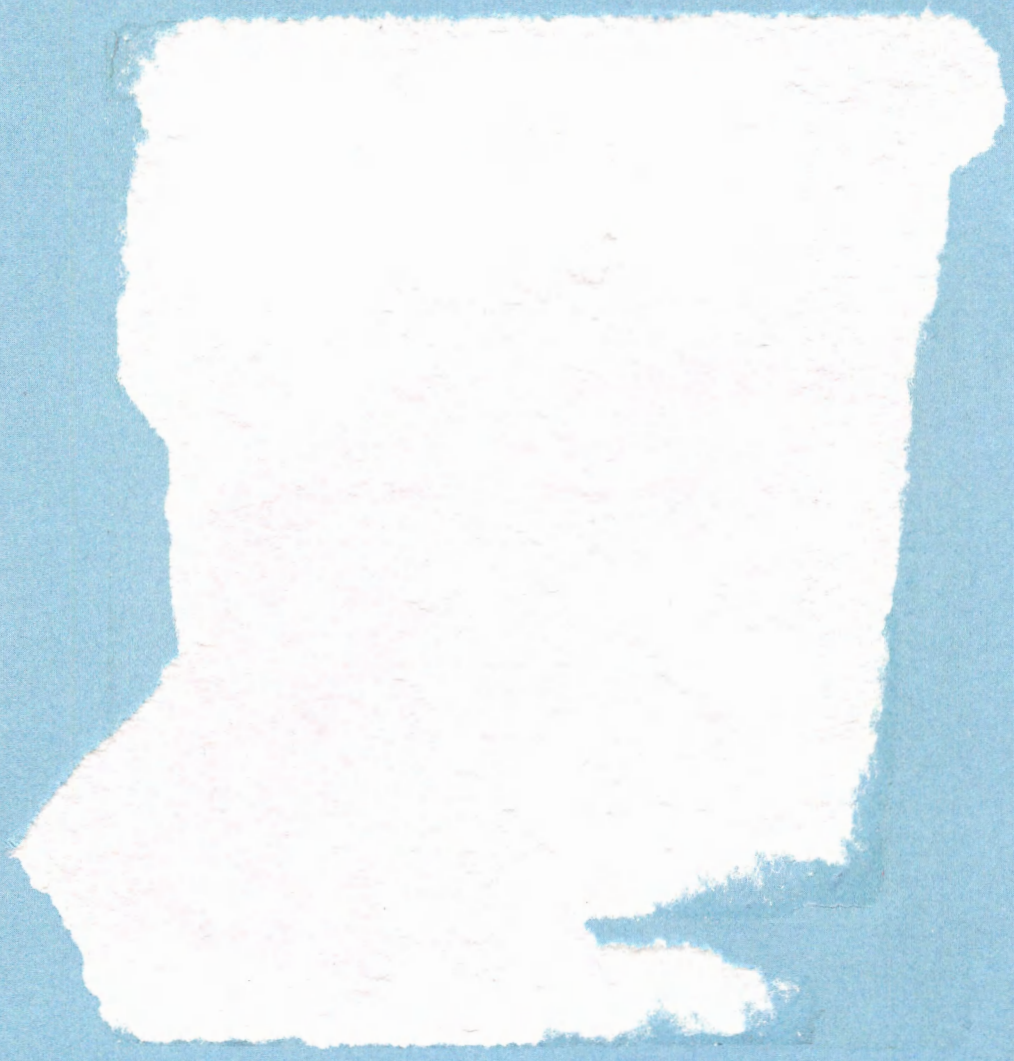
Covers

- Pro AudioSpectrum 16
- Pro AudioStudio 16 and 16XL
- Media Vision Multimedia Upgrade Kits: Pro 16 Multimedia System II, Fusion Double CD 16, and Fusion CD 16

Includes One High Density 3.5-Inch Disk Packed with

- Talking Slideshow—A Software Utility That Makes It a Snap to Create Your Own Sound and Picture Presentation!
- A Special Version of Kaleidescape's Multimedia Showcase
- A Demonstration Version of IN3 Voice Command—an Exciting Voice Command and Control System for Your Computer!

And Much More!



ATTENTION!

While we do everything we can to ensure the quality of this book/disk package, occasional problems may arise. *If you experience problems with this disk, please call:*

Osborne/McGraw-Hill: 1-800-227-0900 ***(Mon.-Fri., 8:30-4:30, Pacific Standard Time)***

12/6/93

About the Software That Accompanies This Book

We're sure you're going to love the batch of software we've collected on the diskette that comes with this book. We spent nearly a month auditioning hundreds of software packages to compile the best ones for you. You're gonna love it. So settle back, relax, and enjoy the show.

Disk Contents:

Kaleidescapes, by Masque Publishing, is a mesmerizing interactive music and image sculpture that showcases your computer's multimedia capabilities. It was created by computer artist John Ratcliffe and award-winning multimedia composer Rob Wallace. You'll be amazed by the stunning 3-D images of objects floating in space and be soothed by the phenomenal electronic music. (It's the 60's all over again!) Kaleidescapes is an interactive experience sure to provide hours of entertainment. The version you'll find on the disk has two scenarios. You can buy the full version of Kaleidescapes at any good software store. The only differences between your version of Kaleidescapes and the full retail version is that you have two scenarios instead of five, and you don't have the ability to play music from audio CDs.

Whoop It Up!, by the Advanced Support Group, Inc., is the most popular shareware utility on the market for adding sounds to Microsoft Windows. Replace your boring Windows sounds with your choice of MIDI music or Wave digital audio sounds. For example, every time your Question Icon appears you can have Whoop It Up! say "What's up Doc?" or play any other sound file you've recorded. You can add a drum roll every time you load a program, or play a trumpet fanfare every time you start your favorite application. Remember: Ten percent of the proceeds from your Whoop It Up! registration will be donated to a nonprofit wildlife preservation organization, so please register.

InCube, by Command Corp, Inc., provides powerful voice command and control over Microsoft Windows programs. A specially customized demo version of the $179 InCube product is included on the disk. Just say "mixer" and your Pocket Mixer appears. This demo version has been specially customized to call up the 14 most frequently used applications, including Media Vision's Pocket Mixer and Pocket CD, and the Windows File Manager, Card File, Calculator, and Calendar. It works great with an inexpensive microphone and any 80386 or better computer.

Talking Slideshow, by Softline, Inc., makes it a snap to create your own sound and picture presentation that runs under Microsoft Windows. Try your hand at multimedia production, creating a trade show demonstration or a training program. Or create a talking family album, complete with everyone's voice and picture. Talking Slideshow combines .BMP files, from Windows Paint or other graphics programs, with Wave digital audio files. For a modest fee you'll be able to buy the commercial version of Talking Slideshow, which includes a printed manual and technical support.

MIDI JukeBox, by Pocket-Sized Software, is an enticing shareware package that provides hours of music pleasure. Select a stack of MIDI and Wave files to play, and MIDI JukeBox will play each tune in turn or repeatedly loop through the stack of songs and sounds. Pocket-Sized Software requests that you register your version of MIDI JukeBox.

MidiKeys, by Playroom Software, is a terrific shareware product that paints a piano keyboard on your screen. Play notes or chords by clicking on the keyboard. MidiKeys is ideal for exploring the sounds of either the FM synthesizer on your sound card or an external one hooked up to your MIDI port. Pull down the list of General MIDI instrument assignments, pick your favorite instrument, and begin playing.

Digital Audio Utility Programs, provided by Media Vision's Developer Support Team, make up a unique toolkit for adding digital audio sound to your PC, making recordings, and experimenting with digital audio recordings. These utilities go far beyond the Play and Recfile digital audio utility programs provided with your sound card. You'll be able to make voice-activated recordings and try out the latest technology for digital audio compression, including real-time compression. Programmers will find accompanying C source code.

Installation Instructions

See Appendix F, "Software on the Supplemental Diskette," for installation instructions.

System Requirements

- IBM PC or compatible Intel 80386SX machine or higher.
- 3MB of hard disk space.
- A 3.5-inch floppy disk drive.
- MS-DOS 5 or higher and 640K of memory for Kaleidescapes and the Digital Audio Utility Programs.
- Microsoft Windows 3.1 and 4MB of memory for the other programs.
- A Pro AudioSpectrum 16, Pro AudioStudio 16, or 100% compatible sound card.
- A mouse is necessary for the Windows programs.

WARNING: BEFORE OPENING THE DISK PACKAGE PROVIDED WITH THIS BOOK, CAREFULLY READ THE TERMS AND CONDITIONS OF THE DISK WARRANTY THAT FOLLOWS.

Disk Warranty

This software is protected by both United States copyright law and international copyright treaty provision. You must treat this software just like a book, except that you may copy it into a computer to be used and you may make archival copies of the software for the sole purpose of backing up our software and protecting your investment from loss.

By saying, "just like a book," Osborne/McGraw-Hill means, for example, that this software may be used by any number of people and may be freely moved from one computer location to another, as long as there is no possibility of its being used at one location or on one computer while it is being used at another. Just as a book cannot be read by two different people in two different places at the same time, neither can the software be used by two different people in two different places at the same time (unless, of course, Osborne's copyright is being violated).

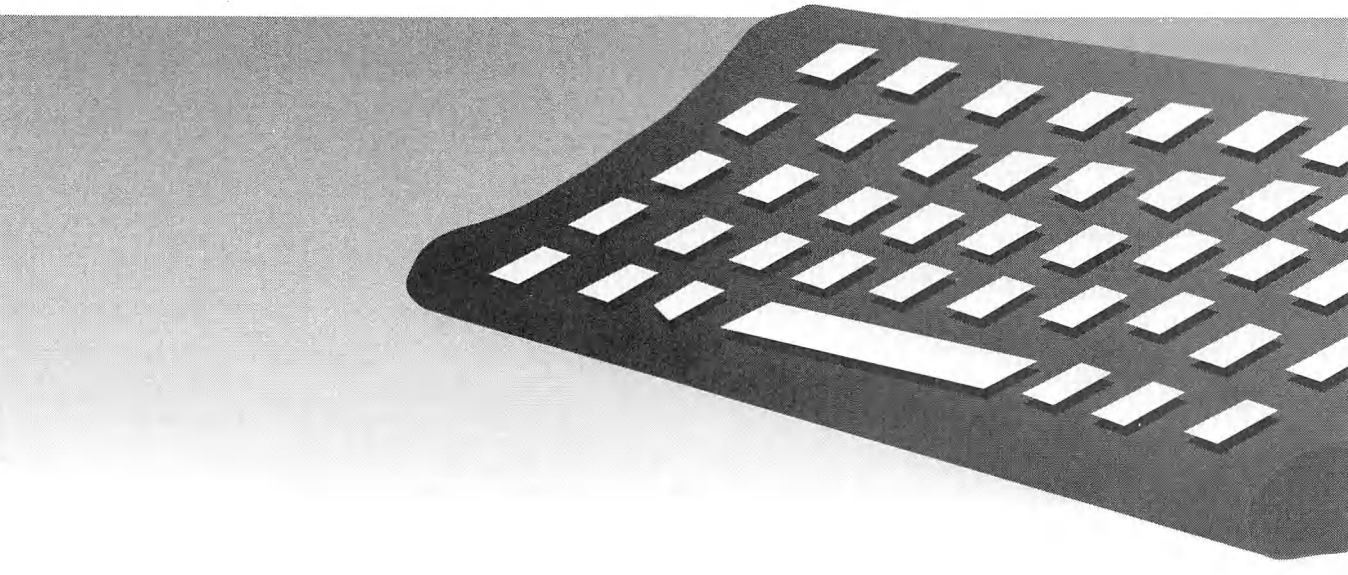
Limited Warranty

Osborne/McGraw-Hill warrants the physical diskette(s) enclosed herein to be free of defects in materials and workmanship for a period of sixty days from the purchase date. If Osborne McGraw-Hill receives written notification within the warranty period of defects in materials or workmanship, and such notification is determined by Osborne/McGraw-Hill to be correct, Osborne/McGraw-Hill will replace the defective diskette(s).

The entire and exclusive liability and remedy for breach of this Limited Warranty shall be limited to replacement of defective diskettes(s) and shall not include or extend to any claim for or right to cover any other damages, including but not limited to, loss of profit, data, or use of the software, or special, incidental, or consequential damages or other similar claims, even if Osborne/McGraw-Hill has been specifically advised of the possibility of such damages. In no event will Osborne/McGraw-Hill's liability for any damages to you or any other person ever exceed the lower of the suggested list price or actual price paid for the license to use the software, regardless of any form of the claim.

OSBORNE, A DIVISION OF McGRAW-HILL, INC., SPECIFICALLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Specifically, Osborne/McGraw-Hill makes no representation or warranty that the software is fit for any particular purpose, and any implied warranty of merchantability is limited to the sixty-day duration of the Limited Warranty covering the physical diskette(s) only (and not the software), and is otherwise expressly and specifically disclaimed.

This limited warranty gives you specific legal rights; you may have others which may vary from state to state. Some states do not allow the exclusion of incidental or consequential damages, or the limitation on how long an implied warranty lasts, so some of the above may not apply to you.



Pro Audio 16: The Official Book



Ivan Luk & David M. Golden

Osborne **McGraw-Hill**

Berkeley New York St. Louis San Francisco Auckland Bogotá Hamburg London Madrid Mexico City
Milan Montreal New Delhi Panama City Paris São Paulo Singapore Sydney Tokyo Toronto

Osborne McGraw-Hill
2600 Tenth Street
Berkeley, California 94710
U.S.A.

For information on software, translations, or book distributors outside of the U.S.A., please write to Osborne McGraw-Hill at the above address.

Pro Audio 16: The Official Book

Copyright © 1994 by McGraw-Hill, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher, with the exception that the program listings may be entered, stored, and executed in a computer system, but they may not be reproduced for publication.

1234567890 DOC 9987654

ISBN 0-07-881979-2

Information has been obtained by Osborne McGraw-Hill from sources believed to be reliable. However, because of the possibility of human or mechanical error by our sources, Osborne McGraw-Hill, or others, Osborne McGraw-Hill does not guarantee the accuracy, adequacy, or completeness of any information and is not responsible for any errors or omissions or the results obtained from use of such information.

Series Design: Seventeenth Street Studios

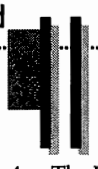
CONTENTS AT A GLANCE

Media Vision and the Pro Audio Family



1	The History of Media Vision—Sound on the PC	3
2	Hardware Installation Hints	31
3	System Software and Drivers	61

Understanding Sound



4	The Basics of Sound	91
5	Advanced Sound Topics	113

Making the Most of the Bundled Software



6	Making Recordings and Playing Music	129
7	Speech	143
8	The Ins and Outs of MIDI	165
9	Media Vision Tools and Toys	189

Third-Party Software and Hardware Enhancements



10	Third-Party Software	217
11	A CD-ROM Compendium	265
12	Choosing Speakers and Microphones	307
13	Joysticks and Other Goodies for the Avid Gamer	339

Appendixes



A	The Media Vision Audio Family	365
B	Questions and Answers from the Technical Support Logs of Media Vision	383
C	SCSI and the Pro Audio Sound Cards	413
D	Resources	425
E	Other Media Vision Products	433
F	Software on the Supplemental Diskette	437
G	Digital Audio Utility Programs	459
	Index	475

CONTENTS

FOREWORD, *XXI*

ACKNOWLEDGMENTS, *XXIII*

INTRODUCTION, *XXV*

Media Vision and the Pro Audio Family

1 The History of Media Vision—Sound on the PC **3**

THE EARLY YEARS, *6*

The Pull of Game Software, 6

The Pull of MIDI Music, 6

The Emergence of AdLib, 8

The Emergence of Creative Labs, 9

THE EMERGENCE OF MULTIMEDIA, 10

MPC Standards, 11

EMERGENCE OF MEDIA VISION, 14

The New Focus: Multimedia, 15

The Multimedia Conference, 15

The Media Vision Strategy, 15

Potholes in the Road to Success, 17

Spending the War Chest, 23

New Challenges, 24

Battling It Out with 16 Bits, 24

MEDIA VISION'S FUTURE, 26

2 Hardware Installation Hints **31**

CONNECTORS AND CHIPS, 33

External Connectors, 33

Internal Connectors, 35

Sound Functions and Their Chips, 38

INTERFACING, 42
Bus Architecture, 42
Running Quick Start, 46
Understanding DMA, 47
Interrupt Requests or IRQs, 51
Port Addresses, 52
Upper Memory, 55
Ideal Settings, 56
INSTALLATION, 56
Tools and Procedures, 57
Recording Your Hardware Setup, 58

3 System Software and Drivers **61**

WHAT ARE SOFTWARE DRIVERS?, 62
THE AUTOMATIC INSTALLATION PROGRAM, 63
DOS DRIVERS, 65
MVSOUND.SYS, 65
Settings in the AUTOEXEC.BAT File, 69
The DOS Mixer (PAS.EXE), 70
WINDOWS DRIVERS, 77
Running DOS Programs in Windows, 78
Settings in the SYSTEM.INI File, 79
Settings in the WIN.INI File, 81
Settings in the Control Panel, 82
Windows Mixers, 86
SUMMARY, 88

Understanding Sound

4 The Basics of Sound **91**

THE SCIENCE OF SOUND, 93
The Nature of Sound, 93
Characterizing Simple Waves, 94
Amplitude, 95
Bandwidth, 97
PC AUDIO TECHNOLOGIES, 100
The Variety of Sound Types, 100
Creating Music and Sound Effects, 100
Recording and Playing Audio: The Basics of Digital Audio, 103
SOUND FILE FORMATS, 108

5 Advanced Sound Topics **113**

COMPLEX WAVEFORMS, 114

Musical Instruments, 114

Speech, 115

Reducing Complex Waveforms to Simple Components: Fourier Analysis, 115

MASTERING DIGITAL AUDIO SAMPLING, 118

The Input Filter, 118

Aliasing, 119

AUDIO COMPRESSION, 120

Audio Compression Requirements, 120

Linear Pulse Code Modulation, 121

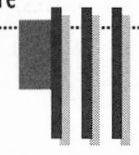
Adaptive Differential Pulse Code Modulation, 121

EVOLUTION OF AUDIO: WHAT'S COMING NEXT, 124

Waveguide Synthesis, 124

Digital Signal Processing, 125

Making the Most of the Bundled Software



6 Making Recordings and Playing Music **129**

DOS PROGRAMS, 131

TrakBlaster Pro, 131

Musicbox, 132

Playfile, 134

Recfile, 134

TPCM, 135

MICROSOFT WINDOWS PROGRAMS, 135

Pocket CD, 136

Pocket Recorder, 136

Sound Impressions, 137

Windows Media Player, 139

Advanced Applications with OLE, 139

ROAD MAP TO MORE SOUND PROGRAMS, 141

7 Speech **143**

SPEECH SYNTHESIS, 145

About Monologue, 145

Monologue for DOS, 147

Monologue 16 for Windows, 149

SPEECH RECOGNITION, 152
The Technology of Speech Recognition, 153
ExecuVoice, 155
ExecuVoice Tips and Tricks, 158
Upgrading from ExecuVoice, 159
More Background on Speech Recognition Technology, 161
What's Next in Speech Recognition, 162

8 The Ins and Outs of MIDI **165**

WHO USES MIDI?, 166
THE ESSENCE OF MIDI, 168
Midi Compositions Are Revisable, 168
THE ANATOMY OF A MIDI NETWORK, 169
MIDI Cabling and Connectors, 170
PLAYING MIDI MUSIC, 171
Your Sound Card's Internal Synthesizer, 171
THE ROLE OF SEQUENCERS, 172
Controllers, 172
THE "NOTE ON" AND "PROGRAM CHANGE" MESSAGES, 173
Note Value, 173
Channel Number, 173
SYNTHESIZERS, 174
Instrument Quality, 174
Patches and Program Changes, 175
Polyphony, 175
A MIDI TUTORIAL WITH RECORDING SESSION, 176
PLUG-AND-PLAY MIDI, 182
Exchanging Files: Standard MIDI, 183
General MIDI Instrument Assignments, 183
Microsoft's Authoring Guidelines, 184
THE MICROSOFT WINDOWS MIDI MAPPER, 185
The Setup Map, 186
Patch Maps, 186
Key Maps, 186
Summarizing: A MIDI Mapper Example, 187

9 Media Vision Tools and Toys **189**

CATALOG OF MEDIA VISION'S BUNDLED CD-ROM TITLES, 191
Educational Titles, 191
Reference Titles, 193
Entertainment Titles, 196
Productivity Titles, 202

GETTING THE BEST PERFORMANCE FROM YOUR CD-ROM TITLES, 204
What to Expect in Performance, 204
Multitasking or the Lack Thereof, 204
How to Cut the Action, 205
Listening to CD-ROMs on Your Audio CD Player, 205
Speeding Up Performance, 205
Dealing with the Dreaded Disk Dilemma: Out of Space, 206
CD-ROM TITLE TROUBLE-SHOOTING, 208
Problems Common to Both DOS and Windows Multimedia Titles, 209
A Windows-Specific Multimedia Title Problem, 210
DOS-Specific Title Problems, 211
THE SOFTWARE PUBLISHERS, 211

Third-Party Software and Hardware Enhancements



10 Third-Party Software **217**
GAMES GALORE, 219
Simulations, 220
Action, 222
Adventure, 223
Sports, 223
Strategy, 225
MUSIC AND MIDI MAGIC, 226
SuperJAM! by Blue Ribbon SoundWorks (Retail: $129), 226
Power Chords by Howling Dog Systems (Retail: $84.95), 227
Boom Box by Dr. T's Music Software (Retail: $59.95), 229
QuickScore Plus by Dr. T's Music Software (Retail: $149), 229
Studio for Windows by Midisoft Corporation (Retail: $249.95), 230
MusicTime by Passport Designs (Retail: $249), 231
Encore by Passport Designs (Retail: $595), 232
Master Tracks Pro by Passport Designs (Retail: $395), 233
Trax by Passport Designs (Retail: $99), 234
Band-in-a-Box Pro by PG Music (Retail: $88), 234

WinSong by Softronics (Retail: $79.95), 236
Cakewalk Professional by Twelve Tone Systems (Retail: $349), 237
Sequencer Plus series by Voyetra Technologies (Retail: $69.95-$299.95), 238
WinJammer by WinJammer Software Limited (Shareware: $50), 238
EDUCATIONAL EXCELLENCE, 239
NotePlay by Ibis Software (Retail: $49.95), 239
Play It By Ear by Ibis Software (Retail: $99.95), 240
RhythmAce by Ibis Software (Retail: $99.95), 242
RhythmPlay by Ibis Software (Retail: $49.95), 243
Soloist by Ibis Software (Retail: $59.95), 243
Music Mentor for Windows by Midisoft Corporation (Retail: $149.95), 245
USEFUL UTILITIES, 246
Whoop It Up! by Advanced Support Group (Retail: $79.95), 246
Wired for Sound Pro by Aristosoft (Retail $79.95), 247
After Dark by Berkeley Systems (Retail $49.95), 247
Blaster Master by Gary Maddox (Shareware: $29.95), 248
EZSound FX by Future Trends Software (Retail: $69.95), 248
SoundSculptor by Ibis Software (Retail: $39.95), 250
Mr. Sound FX by Prosonus (Retail: $24.95), 250
AudioView by Voyetra Technologies (Retail: $129.95), 250
Multimedia Toolkit by Voyetra Technologies (Retail: $499.95), 251
PatchView FM by Voyetra Technologies (Retail: $99.95), 252
PROGRAMMING TOOLS, 252
DigPak and MidPak by THE Audio Solution (License fees vary from $69.95 to $5,000), 253
Multimedia Music Library by Midisoft Corporation (Retail: $79.95), 253
MusicBytes by Prosonus (Retail: $99.95), 254
Sound Factory by Voyetra Technologies (Retail: $199.95), 255
MusiClips by Voyetra Technologies (Retail: $69.95 and up), 256
COMPELLING CD-ROM TITLES, 256
Games, 257
Reference, 258
Educational, 259
THE SOFTWARE PUBLISHERS, 260

11 A CD-ROM Compendium **265**

WHY DO YOU WANT A CD-ROM DRIVE?, 267
A Brief History Lesson, 267
CD-ROM Storage Capacity, 268

KNOW BEFORE YOU BUY, 271
How Fast Is It?, 271
How Compatible Is It?, 275
How Reliable Is It?, 280

MAKING A PURCHASE DECISION, 282
Internal or External?, 284
Finding the Right Cables and Connectors, 285
A Selection of CD-ROM Drives, 286

FINDING THE BARGAINS, 294

INSTALLING A CD-ROM DRIVE WITH YOUR PRO AUDIO SOUND CARD, 295
The Hardware, 295
The CD-ROM Driver Software, 297

IMPROVING PERFORMANCE WITH A SOFTWARE CACHE, 303
Caching CD-ROM, 303

12 Choosing Speakers and Microphones **307**

CHOOSING THE RIGHT SPEAKERS, 309
Powered Versus Unpowered, 309
Sound Quality, 310
Bells and Whistles, 313
Other Important Features to Consider, 315

A SAMPLING OF SPEAKERS, 318
Small Budgets (under $50), 318
Medium Budgets ($50 to $150), 320
Good Full Range ($150 to $300), 324
The Best and Most Expensive (over $300), 328
Subwoofers—Feeling the Sound, 333

SOURCES AND PLACES TO PURCHASE SPEAKERS, 334

GETTING THE MOST FROM YOUR NEW SPEAKERS—SETUP AND POSITIONING, 335

ABOUT MICROPHONES, 336

13 Joysticks and Other Goodies for the Avid Gamer **339**

JOYSTICK BASICS, 341

SIMULATION CONTROLS, 342
CH Products, 342

ThrustMaster, 346
Which Simulator Control Should You Buy?, 355
CONTROL PADS FOR ARCADE AND ACTION GAMES, 356
Advanced Gravis PC GamePad ($29.95), 356
Suncom Command Control ($19.95), 358
CONTROLS FOR THE FUTURE, 359
R&R Electronics EPIC ($389), 359
QUICK JOYSTICK TROUBLE- SHOOTING, 360
Speed-Compensating Joystick Cards, 361
SOURCES, 362

Appendixes



A The Media Vision Audio Family **365**
PURCHASING MEDIA VISION PRODUCTS, 367
Selecting a Reseller, 367
Buying Direct from Media Vision Resources, 367
Getting a Bargain, 367
POPULAR MEDIA VISION PRODUCTS, 368
MEDIA VISION'S MOST POPULAR 16-BIT SOUND CARDS, 369
Pro AudioSpectrum 16, 369
Pro AudioStudio 16, 369
Pro AudioStudio 16XL, 370
Pro Audio 16 Basic, 370
TYPES OF SOUND AND MUSIC SOFTWARE, 370
A COMPARISON OF MEDIA VISION'S 16-BIT CARDS, 371
COMPARISON OF MEDIA VISION'S 16-BIT MULTIMEDIA UPGRADE KITS, 373
COMPARISON OF OTHER MEDIA VISION PRODUCTS, 376
Pro AudioSpectrum, 378
Fusion CD, 379
Pro AudioSpectrum Plus, 379
Pro 16 Multimedia System, 379
RELATED PRODUCTS, 379
Accesories, 380
Macintosh Media Vision Audio Products, 380
Pro AudioSpectrum 16 Compatible Cards, 380

B Questions and Answers from the Technical Support Logs of Media Vision **383**

RESOURCES, 384

ABBREVIATIONS, 385

SOUND TYPES, 385

SUPPORTED CD-ROM DRIVES, 386

PRO AUDIO MISCELLANEOUS INFORMATION, 386

BEFORE CALLING TECHNICAL SUPPORT FOR HELP, 387

STANDARD TROUBLE- SHOOTING STEPS, 388

Generic CONFIG.SYS, 389

Generic AUTOEXEC.BAT, 389

DEFAULT DMA AND IRQ SETTINGS USED BY THE PRO AUDIO 16, 389

THE PAS16 I/O PORT ADDRESS MAP, 390

DEFAULT SETTINGS USED BY THE SOUND BLASTER, 390

QUESTIONS AND ANSWERS, 390

PAS16 Hardware Installation, 391

PAS16 Software Installation, 392

SCSI Interface, 394

Stereo Studio FX, 398

SP Spectrum, 398

TrakBlaster Pro, 399

Monologue, 399

Lotus 1-2-3 for Windows with Multimedia Help, 400

Windows Drivers and Pocket Tools, 401

PAS.EXE, 405

RECFILE and PLAYFILE, 405

CD-ROM Applications, 406

Games, 407

Bus Mastering Device, 411

OS/2 Driver Support, 411

C SCSI and the Pro Audio Sound Cards **413**

WHAT IS SCSI?, 414

SCSI Standards, 415

SCSI Address, 417

Termination, 417

THE PRO AUDIO SCSI PORT, 419

SCSIWORKS!, 420

What SCSI Devices Can I Attach to the Pro Audio?, 420

Introduction to ASPI, 421

Technical Specifications, 423

Source, 423

D Resources **425**

ON-LINE SERVICES, 426

CompuServe, 426

Internet, 428

Media Vision's BBS, 429

MAGAZINES, 429

General Purpose Magazines, 429

Game Magazines, 429

IMPORTANT ORGANIZATIONS, 430

MEDIA VISION DEVELOPER'S TOOLKITS AND CONFERENCES, 430

Computer Game Developer's Conference, 431

Media Vision Developer's Conference, 431

Media Vision Developer's Kits, 431

E Other Media Vision Products **433**

Pro MovieStudio (Retail Price: $449), 434

Pro Graphics 1280 (Retail Price: $995), 434

Pro AudioSpectrum 16 Macintosh (Retail Price LC Bus: $395; NuBus: $495), 435

CD-ROM Multimedia Kit for Macintosh (Retail Price: $899), 435

F Software on the Supplemental Diskette **437**

DISK INSTALLATION, 438

Full Installation, 439

Partial Installation, 441

USING THE SOFTWARE, 441

InCube Voice Command by Command Corporation, Inc., 442

Multimedia Kaleidescapes by Masque Publishing, 446

MidiKeys, a Virtual MIDI Keyboard, by Playroom Software, 448

MIDI JukeBox by Pocket-Sized Software, 450

Talking Slideshow by Softline, Inc., 452

Whoop It Up! by Advanced Support Group, Inc., 453

THE SOFTWARE PUBLISHERS, 454

G Digital Audio Utility Programs **459**

GETTING HELP, 461

ACCESSING THE UTILITIES, 461

PREPARATIONS, 462

CAPITALIZATION AND FLAGS, 462

COMPRESSION WITH CMPWAV, 463
Copying the Sound Sample, 463
Restoring the Sound Sample, 463
Syntax, 463
Examples, 463
Limitations of CmpWav, 465
Technical Notes, 466
PLAY AND RECORD WITH TPCM, 466
Digital Audio Play, 466
Onscreen Display of Command Line Switches, 466
Digital Audio Recording, 468
PCM FUN WITH PCMFUN, 471
Examples, 471
MEDIA VISION'S PCM, 473
SOURCE CODE, 474

Index **475**

FOREWORD

In this time of rapid change, we have all become perpetual students of the new. Keeping up with multimedia hardware and software products is particularly challenging. This book can help you become more adept and familiar with Media Vision sound products so you can enjoy the richness of multimedia applications—be they for entertainment, education, or business.

Whatever software you choose, you will discover new power and effectiveness for both play and work. Sound and motion add excitement and professionalism to everything from games to business presentations. And learning has never been so much fun before.

This new dimension that multimedia has brought to computing has attracted a broad spectrum of consumers who are already accustomed to quality sound and full-motion video in other home electronics products such as stereo equipment and televisions. As personal computers become more like consumer products, prices are steadily dropping and usability is steadily improving. The outcome is sure to be an even more rapid growth in the demand for sound and video add-on products.

Pro Audio 16: The Official Book can help you open up this new world by taking you quickly through what most people find to be the most daunting phases—installing the hardware and troubleshooting any problems that arise. This book also tells you where to go for additional information, including several ways to contact Media Vision.

Media Vision will continue to introduce new hardware equipment, along with software titles on CD-ROM, and will expand the world of desktop multimedia with affordable sound and video products—one step at a time. We appreciate your interest in learning more about our products, and we welcome your comments and feedback.

Satish Gupta
Vice President, Strategic Marketing and Development
Media Vision
Fremont, California

ACKNOWLEDGMENTS

THIS book would never have materialized without the efforts and contributions of many individuals. We've tried our best to remember everyone. Almost inevitably, we'll miss a few of you. To you we extend our apologies, and gratitude for your contribution.

First of all, a couple of big hugs and Thank You's to Frances Stack. She not only demanded the best from us (almost daily at some points), but also kept our writing focused on our audience: you. Thanks for the encouragement and invaluable feedback throughout the project. This book would never have been in such a polished state if not for Frances.

Numerous supporters at Media Vision deserve medals for their contributions. Elizabeth Fairchild was always there to meet our sometimes demanding requests—thanks for an outstanding job. We'd also like to thank Marnee Clement for helping Elizabeth to help us. Thanks to Rick Allen for keeping us honest and accurate, to Tim Bratton for getting Media Vision involved and for the history lesson, to Bart Crane for the programming utilities and technical help, to Doug Cody for help in the initial stages, to Rick Clark, Susan Whitehead, and Darlo Perez for suggestions and technical help, and to Deborah Gronski for believing. And thanks to some of the other stars at Media Vision:

Gary Kinsey
Gonzalo Carrera
Gordon Storga
Joey Barrameda
John Burgstrom
Rik Sauer
Shoieb Yunus
Sue Nguyen
Susan Cook

We would like to thank the many individuals in the Tech Support department whom we harassed. Thanks to Media Vision for providing us with great products that we can write about.

The quality software on the included disk adds immeasurably to this book. Thanks to all those who kindly allowed us to include their programs: C. Brantley Kelly, Jr., Don Stegall, Eric Bergman-Terrell, John Ratcliffe, Ken Mocabee, Rob Wallace, and Steve Santi.

Thanks to the many companies that sent us their hardware and software for review. Some of them went to extreme lengths to provide us with their products and documentation. We'd like to thank all of them, including Bob Foscolo, Buzz Hoffman, Cameryne Roberts, Cathy Panos, Charles L. McHenry, Charlie Andrews, Chris Simpson, Christy Germscheid, Cindy Kear, Courtney Harrington, Dan Zemaitis, David Seifert, Debra Brown, Don Zamora, Jim Hassert, Jim Ryan, Jim Switz, Kimo Yoshida, Linda Stifler, Marilyn Young, Mark Waker, Melissa Carter, Mike Gordon, Richard Jacks, Russell Clark, Ryan Hanton, Sari Barnhard, Scott Jangro, Scott Schroeder, Sherry Huss, Steve Edwards, Susan Haywood, Susan Sherman, and Virginia Busnarda. Thanks to all the users of the Media Vision BBS and CompuServe forums, who have contributed unknowingly in one way or another to this book.

The team at Osborne/McGraw-Hill has worked their magic as usual. Thanks to Bill "Can I Have It This Afternoon?" Pollock for giving us this opportunity and entrusting us with such a formidable task. To Bob Myren, Nancy McLaughlin, Kathryn Hashimoto, Emily Rader, Cindy Brown, and Sherith Pankratz—thank you for your efforts and patience. It takes more people to glue a thing like this together than most of us realize.

Ivan would like to thank Loretta, for enduring the many long nights and early mornings of the "clickity-clack" of the computer keyboard emanating from the room down the hall as deadlines drew near. And to Chee Wooi—thanks buddy, for the encouragement and the many sanity checks throughout the project. To all my friends at EggHead and Software, Etc., a thousand Thank You's for providing feedback about what your customers are buying, the questions they ask, and the problems they run into. Finally, I'm indebted to the MCAPs—you know who you are—not just for your support, but for much more than you realize—and much more than I dare reveal.

INTRODUCTION

WHY would anyone need a book about their Pro Audio sound card? This was a question we asked ourselves over and over throughout the development of this book. Being Pro Audio users ourselves, we found that the manuals really didn't tell us much about how to really make the Pro Audio card shine. This book has an ambitious goal—not only to provide you, the Pro Audio sound card user, with information not found in the manuals, but also to inform and educate you to about the world of sound on your PC and other closely related subjects.

ABOUT THIS BOOK

Pro Audio 16: The Official Book is unique in two ways. As we go to press, this is the first book that covers the Pro Audio family of sound cards in depth. Even more important, this is the only book on the Pro Audio sound card specifically endorsed by Media Vision, the creators and manufacturer of the Pro Audio family of sound cards. That special relationship has allowed us to work closely with Media Vision to provide you with the most comprehensive and valuable insights to the Pro Audio sound cards outside of the manuals. Instead of rewriting the Pro Audio manuals, we've plugged up the gaps left by the manuals and provided information about your Pro Audio sound card not found anywhere else.

In researching this book, we spent many long days talking to Media Vision technical support and engineers, and monitored hundreds—if not thousands—of messages (we lost count after a couple of weeks!) on the Media Vision Bulletin Board System (BBS) and their CompuServe forum. We gleaned information about how the majority of the Pro Audio users used their cards from the registration cards they returned to Media Vision. Then, based on this information, we searched for software and hardware that would be of interest to most of you. We acquired these programs and devices,

installed them on our systems, and played with them firsthand so that we could provide you with our impressions of the numerous products available, and a guide to purchasing them yourselves. Many times, we ran out of hard disk space as we perused countless software titles. The extra effort was worth it, because we believe that we've met our lofty goal of providing you the best guide to the Pro Audio sound card anywhere.

This book would not be complete without the accompanying disk, which contains some terrific software. We hope you'll use these programs for fun as well as for exploring the many aspects of the Pro Audio sound card, and that you'll find them as useful, effective, and valuable as we did.

A ROAD MAP TO THIS BOOK

We do not intend for you to read this book from cover to cover, starting at the beginning and going through the chapters in sequence. Feel free to jump around to topics that interest you. The book is divided into five parts, with each chapter therein covering a specific topic.

Part 1: Media Vision and the Pro Audio Family

- Chapter 1, "The History of Media Vision—Sound on the PC" This chapter unravels the amazing story of how sound cards, and the Pro Audio sound cards in particular, have taken the computer world by storm. You'll discover how Media Vision, in a few short years, was catapulted into the forefront of this industry. In the course of this story you'll read all about the features packed into your sound card. Chapter 1 concludes with a glimpse of the very latest in sound cards and multimedia systems, and of what to expect in future developments.
- Chapter 2, "Hardware Installation Hints" This chapter is essentially a miniature encyclopedia on installing and troubleshooting your sound card. Here we explain the PC concepts most essential for successful installation of your Pro Audio sound card, such as interrupts, DMA, device conflicts, and the like. This section also describes the various parts of your sound card, including the connectors for SCSI, MIDI, audio in/out, the joystick, and the microphone.

- Chapter 3, "System Software and Drivers" In this chapter, we describe and explain system-level software that will directly affect your sound board. Featured topics include software such as the DOS and Windows Mixers, the DOS TSR, and "MVSOUND.SYS" and their functions. In addition, we instruct you on setups to use with the Pro Audio sound card in both DOS and Microsoft Windows.

Part 2: Understanding Sound

- Chapter 4, "The Basics of Sound" This chapter explains sound in everyday terms. What is sound? How is it generated? What sort of sound does the Pro Audio sound card work with? By sticking to the topics most relevant to sound cards and using diagrams to explain the most important concepts, this chapter provides a strong foundation on how sound and music is created by your sound card. The various methods of sound synthesis, such as FM synthesis and wave table synthesis, will be introduced here. We explain how sounds are recorded, stored, and played in digital form on the PC. We then discuss digital sampling, digital-to-analog conversion and analog-to-digital conversion, bandwidth, dynamic range, and other topics that are rarely presented in a non-technical fashion. You'll also find an encyclopedia of the most frequently encountered sound file formats.
- Chapter 5, "Advanced Sound Topics" The more technically challenging, exotic, and leading-edge sound technologies are presented in this chapter to help you complete your mastery of the theory behind sound cards. Here we present the ADPCM technique for audio compression, and trade-offs in performing compression. To provide a background for what the future holds in sound technology, we describe the nature of complex waveforms and the techniques used to reduce a complex wave into simple components—technology that underlies speech recognition and synthesis. You'll then learn about technologies that are just around the corner, such as waveguide synthesis and digital signal processing.

Part 3: Making the Most of the Bundled Software

- Chapter 6, "Making Recordings and Playing Music" This chapter will help you maximize the use of the recording and game software bundled with your Media Vision sound card. These programs work with CD audio, digital audio, FM-synthesized music, and MIDI. In

the Windows section of this chapter, we explain OLE (Object Linking and Embedding) and give an example with sound that you can try.

- Chapter 7, "Speech" This chapter covers the wonderful new world of speech on the PC. We describe how speech synthesis and recognition works, and show you how to make full use of both the Monologue program for speech synthesis and the ExecuVoice program that gives you spoken control over your computer.
- Chapter 8, "The Ins and Outs of MIDI" This chapter features a discussion of what MIDI is all about and how a MIDI network is put together. It will introduce you to key concepts and terminology you'll need to know for diving deeper into MIDI. A tutorial on the Recording Session program, sold by Media Vision, shows you how MIDI music can be played on the PC. This chapter concludes with a discussion of the evolution of MIDI standards, which has led to the support of MIDI on multimedia PCs.
- Chapter 9, "Media Vision Tools and Toys" This chapter covers the software provided by Media Vision that doesn't fit neatly into the other chapters. The software described here is bundled with Media Vision's multimedia upgrade kits; it includes many of the hottest titles in multimedia today, such as Compton's Interactive Encyclopedia and 7th Guest. In this chapter, you'll find plenty of tips on getting the most value out of these titles and all your CD-ROM software.

Part 4: Third-Party Software and Hardware Enhancements

- Chapter 10, "Third-Party Software" Here we provide a wide sampling of exciting and innovative software that is compatible with Media Vision Pro Audio sound cards. This chapter is essentially a mini buyers' guide to some of the most exciting software available for use with your Pro Audio card.
- Chapter 11, "A CD-ROM Compendium" In this chapter, we present a clear discussion of CD-ROM technology, including such topics as MPC compliance, seek time, transfer rate, and interface. Helpful diagrams compare the advantages and disadvantages of different CD-ROM drives that are compatible with the SCSI interface on the Pro Audio sound cards. The chapter will equip you with the knowledge required to make a good CD-ROM drive purchase.

- Chapter 12, "Choosing Speakers and Microphones" Here, we provide tips on selecting the right speaker and microphone for use with the Media Vision sound cards. Topics such as frequency response and shielding are thoroughly discussed. The chapter includes mini-reviews of some of the more readily available speakers and microphones designed for use with a PC.
- Chapter 13, "Joysticks and Other Goodies for the Avid Gamer" This chapter provides information on some of the innovative peripheral products that can be used with Media Vision Products. We cover everything from steering wheels and flight control yokes to advanced joysticks featuring multiple buttons and exotic features like the five-way switch hat.

Part V: Appendixes

- Appendix A, "The Media Vision Audio Family" This appendix lists and describes all the sound cards and multimedia upgrade kits offered by Media Vision. We describe the differences between the cards, and the distinctive features of each. This is a reference section which includes detailed specifications as well as an outline of what you'll get when you buy one of these sound boards. Check out the tips in this appendix if you're looking to find the best bargain in a sound card, multimedia upgrade kit, or complete multimedia system.
- Appendix B, "Questions and Answers from the Tech Support Logs at Media Vision" Here is a list of often-asked questions and answers provided by Media Vision's technical support team. Use this appendix as a quick troubleshooting guide for solving problems that you may encounter.
- Appendix C, "SCSI and the Pro Audio Sound Cards" This appendix details the SCSI on the Pro Audio cards. It includes a look at SCSIworks! and at some devices that can be attached to the SCSI interface on the boards.
- Appendix D, "Resources" Here is a directory of sources for further information, such as CompuServe and Internet, recommended music and technical magazines, industry-related companies, etc. Details of the Media Vision Software Developer's Toolkit and Conference are also covered here.
- Appendix E, "Other Media Vision Products" This appendix briefly several Media Vision products aside from their sound cards for the PC—for example, the Pro Video Spectrum video capture card.

- Appendix F, "Software on the Supplemental Diskette" Here is an overview of each software program included on the diskette that accompanies this book, along with helpful screen shots. We've chosen from among the best and most relevant shareware and public domain programs to give you hours of fun and excitement with your Media Vision card.
- Appendix G, "Digital Audio Utility Programs" The supplemental diskette also includes DOS command line utility programs from Media Vision that are a veritable "science kit" for experimenting with digital audio. You can add sounds to your PC that'll play from batch files. You can create voice-actuated recordings that will ignore pauses between sentences. With the compression utility you'll be able to squeeze audio files to as little as one-quarter their original size, and you'll even be able to record compressed audio direct to disk. If you consider yourself a hotshot C programmer, we've got a treat for you: C source code for the two most important utilities.

REACHING THE AUTHORS

We wouldn't put our name on something we don't believe in—and we are confident that this is the best book on the market for anyone who's looking to take full advantage of their Media Vision Pro Audio sound card. In our continuing efforts toward this objective, we invite you to send us your feedback. You can do so by writing and sending your letters to:

Osborne/McGraw-Hill
2600 Tenth Street
Berkeley, CA 94710
U.S.A.
ATTN: Pro Audio 16: The Official Book

If you have a CompuServe account, you can reach us directly:

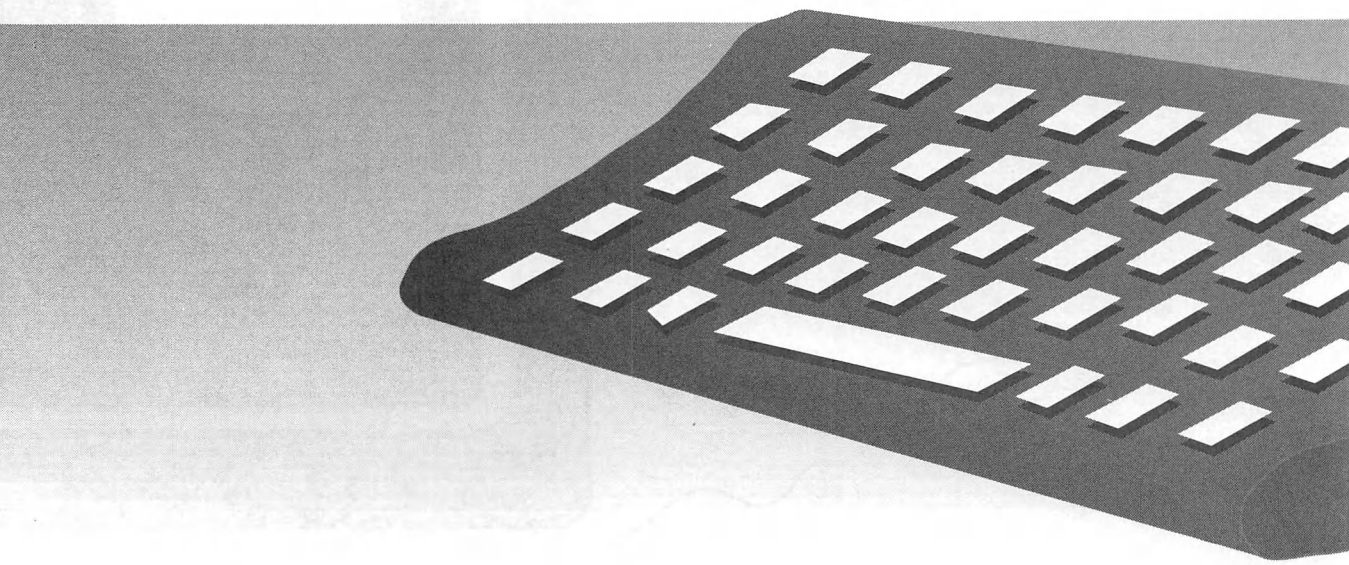
Ivan Luk 76515,2156
David Golden 73020,3337

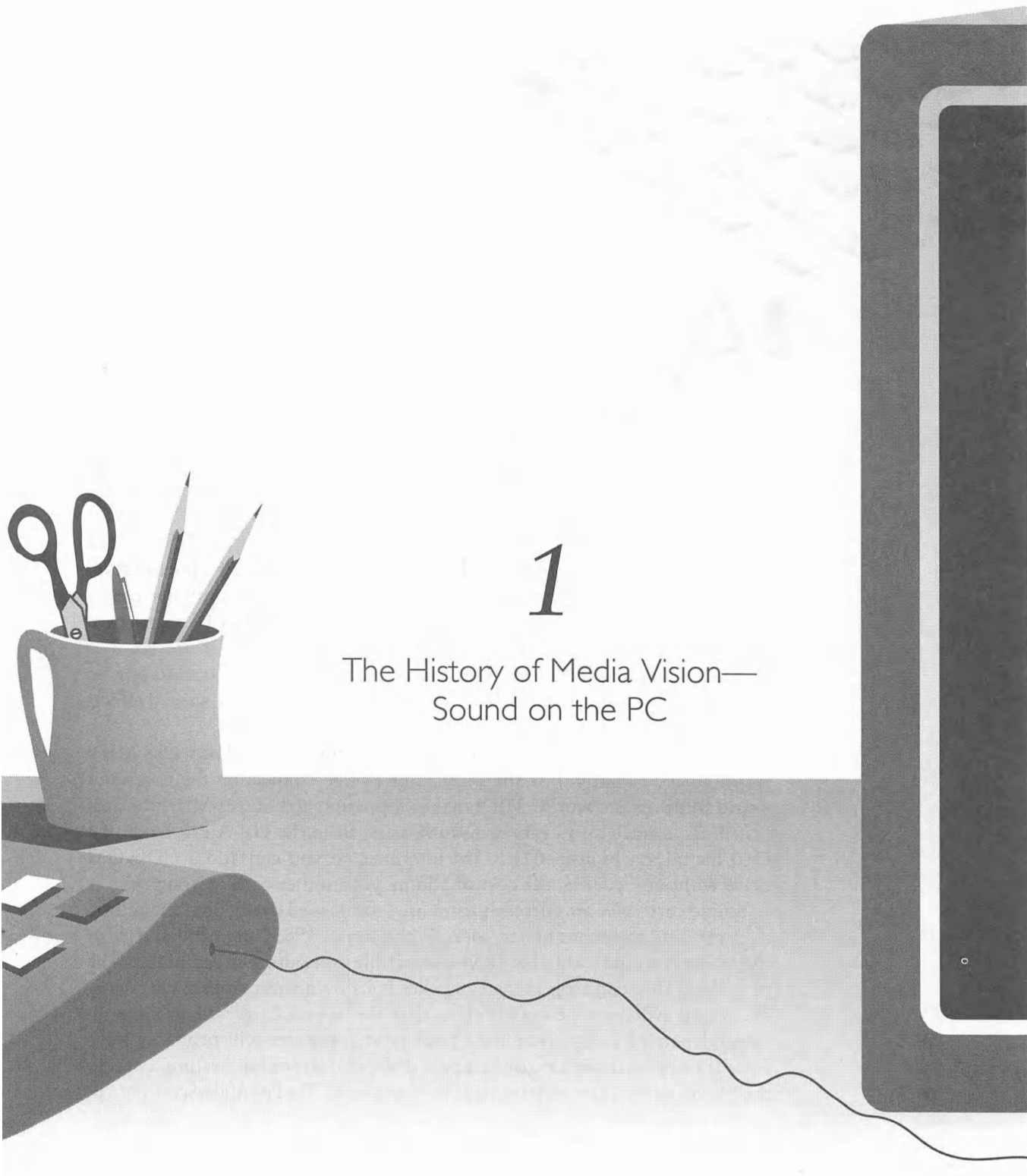
Your input is very important to us. We want to provide you with the most useful and valuable book for your Pro Audio sound card—and you can help us do that. We look forward to hearing from you.

I

Media Vision and the Pro Audio Family

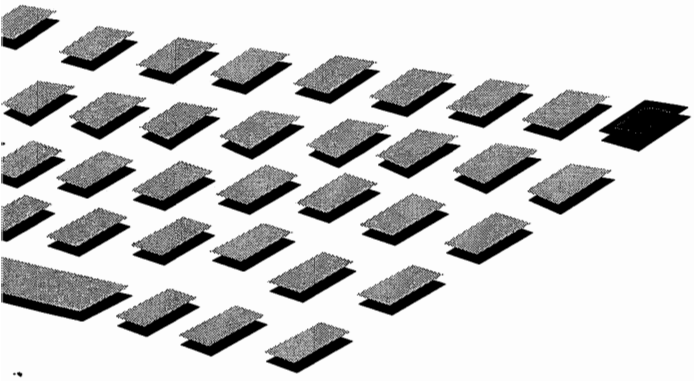






1

The History of Media Vision—Sound on the PC



As this book goes to press in late 1993, you can buy a high quality sound card in the Pro Audio 16 family, with a wonderful bundle of features, for a "street" price of not much over $100. The sound card delivers crisp stereo sound, making your games come alive with such sounds as a race car roaring by from one speaker to the other before receding into the distance.

Digital audio—sound stored on your hard disk as computer bytes—can be recorded and played back to add your voice to a multimedia presentation that combines graphics, music, and sound, or to spice up computer games with special effects such as a crack of lightning. A Pro Audio 16 sound card can add up to 20 synthesized musical instrument sounds in stereo. The frequency modulation (FM) synthesizer, which uses FM technology to simulate familiar instruments like the piano, can also generate special effects like the sound of a seashore.

The *music instrument digital interface* controller, better known as MIDI (pronounced "middy"), is the musician's bridge connecting the computer world to the music world. MIDI makes it possible to control MIDI musical instruments, such as a keyboard synthesizer, from the PC. A Pro Audio 16 card includes a built-in CD-ROM interface, so you can add a CD-ROM drive without incurring the cost of adding yet another card to your PC.

Sound card sales are currently estimated to run well over a quarter-million a month, and they continue to soar. By the end of 1993, an installed base of five million sound cards for IBM-compatible computers is estimated. The only thing that can stop this steamroller is its own success: In a few years, PC sound will be so commonplace that the sound card will become an integral part of every computer. Your next computer will probably have several integrated circuits (or "chips") dedicated to sound, nestling close to the 80486 or Pentium chip on your motherboard. The Pro AudioSpectrum 16,

Media Vision's best-selling sound card—and the first sound card with 16-bit digital audio for less than $500—can be seen in Figure 1-1.

The sound card industry has become an exciting two-horse race. As 1993 comes to a close, many players compete in the sound card industry, but two dominate the market: Media Vision and Creative Labs. Media Vision's sound cards and Creative Lab's Sound Blaster family together account for an estimated 80 to 90 percent of the IBM-compatible sound cards sold today. Media Vision doesn't dare slow its pace of product innovation, since surely another company would step ahead with new products. This competition is pushing Media Vision to launch even better, more affordable sound cards and multimedia products.

This chapter will first present a short but exciting history of sound cards on the PC. You'll see how the stage has been set for this industry's rocketing success. The story resembles a real-life video game, with rapid attacks and counter-attacks and sudden twists of fate. The history of sound cards involves individuals in small companies half a world apart, and it is also proving to be an epic high-tech struggle fueled by venture capital and public stock offerings, one in which the consumer is sure to come out the winner. We'll tell you, for the first time in print, the full story behind Media Vision's

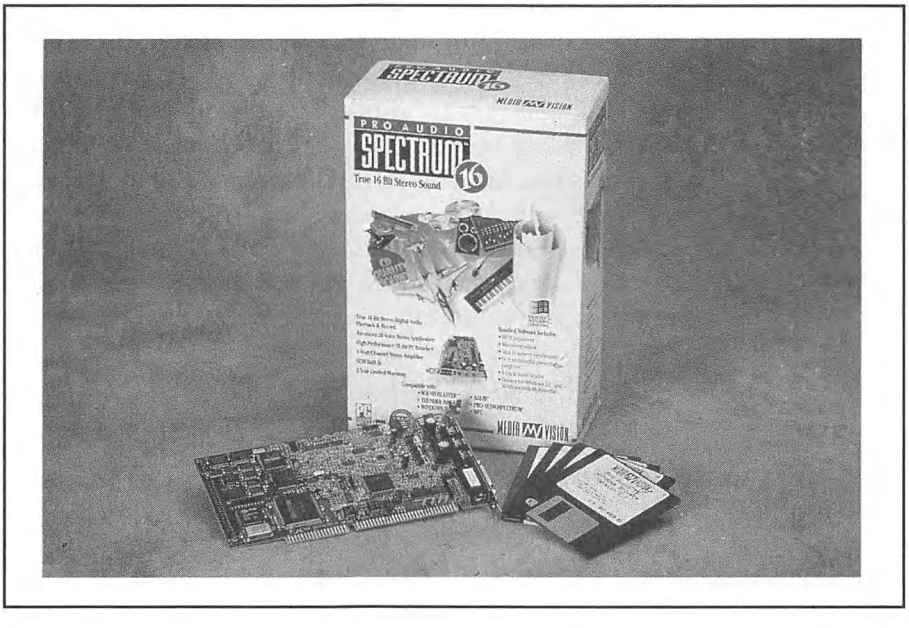


FIGURE 1-1 *The Pro Audio-Spectrum 16, Media Vision's popular sound card*

amazing success story. Then we'll wrap up this chapter by briefly describing Media Vision's push into the video and publishing side of multimedia.

THE EARLY YEARS

Even prior to the recent burst of interest in sound cards, the PC wasn't silent. The first IBM PC could produce clicks and beeps out of its 50-cent speaker, and it could generate enough tones to play simple melodies. However, this early sound can hardly be called music, nor could it produce intelligible speech or decent sound effects.

Soon after the PC was introduced in 1981, various musicians and PC enthusiasts noted this poverty of sound. A personal computer should be able to make better sounds—after all, other computers, including the Atari, Apple, and Commodore, could play a decent tune. In these early years, a few sound cards for musicians and very simple speech synthesizers did appear, but none became particularly popular.

The Pull of Game Software

Sound card sales accelerated in the late 1980s and began to really take off in 1990, driven by skyrocketing sales of game software. Once PCs with color graphics became affordable and proliferated in the home, computer games would inevitably catch on. Multimedia is hyped as the next wave in business computing, and sound cards are frequently purchased for this reason, but most people buy sound cards for "edutainment"—education and entertainment—reasons. An estimated 90 percent of sound cards are used primarily for adding sound to games. Figure 1-2 shows Media Vision's original magazine advertisement, which targeted PC gamers. Look closely, and you'll see an airplane cockpit stuffed with audio equipment, including a keyboard synthesizer, turntable, tape recorder, video monitor, and headphones. (Fortunately Media Vision had the good sense to not put 100-watt stereo speakers into the cockpit!)

The Pull of MIDI Music

During the early years, the second most important driving force behind the sale of sound cards, after the game market, was the music market. Musicians discovered that blending computer technology and MIDI music technology revealed a wonderful new musical universe. With a computer that "talks MIDI" they could play MIDI instruments such as a keyboard

FIGURE 1-2
Media Vision's first advertisement, aimed at PC gamers



MEDIA VISION ANNOUNCES AUDIO FOR PC GAMERS WHO AREN'T WET BEHIND THE EARS.

Sure, you're a confirmed, 100% hardcore PC gamer. With the mega-speed, high-resolution PC to prove it. But you're missing a big part of the action.

That big, brassy, blood-pumping arcade sound. Which is why we invented the Pro Audio Spectrum™ audio adapter, the most powerful game enhancer since the joystick.

The power comes from Spectrum Sound,™ our unique shielded architecture which gives the cleanest, purest high-fidelity audio of any PC board — all in stereo sound. You can even blast CD sound directly through your game speakers with a CD-ROM drive. Or make your own music through a midi connection.

And only Pro Audio Spectrum offers forward compatibility with the new Microsoft® Level 1 multimedia standard. Preparing you for the next generation of games before they even hit the stores. Plus, you can play all of today's Adlib compatible games.

Make some real noise, call Media Vision today!

The sound of the future is available, today. Call Media Vision for all the juicy specs at **1-800-845-5870.** And prepare your ears for a serious workout.

MEDIA VISION

Media Vision, 47221 Fremont Blvd., Fremont, CA 94538. 415-770-8600, FAX: 415-770-8648.
Pro Audio Spectrum is a trademark of Media Vision, Inc.; Microsoft is a trademark of Microsoft Corporation; AdLib is a trademark of Ad Lib, Inc.

synthesizer or drum machine, record the notes, modify the composition, and then replay and even print the score on paper.

Electronic music and computer-based score production had existed for decades, and blossomed in the 1970s, but the equipment was so expensive

that only academics and crazed artists could experience it. At that time, a lack of standards created anarchy. If you bought a keyboard synthesizer from one company, you couldn't connect it to the drum module of a second company, or the keyboard synthesizer from a third. This incompatibility had a chilling effect on instrument sales, because once you started buying equipment from one company, you were locked into that company. In 1981, a group of musical instrument companies came together to bring coherence to the industry.

By 1982, the MIDI standard for musical instruments was published. This standard ensured that all instruments and sequencers, whether manufactured by Korg, Roland, Yamaha, or some other company, could all talk to each other as members of the same electronic "band." Consumer acceptance was so strong that in a few years MIDI became an unchallenged music industry standard. Along with this acceptance came the need for MIDI interface cards to turn the PC into the leader of the band.

The Emergence of AdLib

The card that truly began to blast sound from the PC was the AdLib card. When the relatively inexpensive AdLib sound card was launched in August, 1987, this novelty was greeted with skeptical curiosity by the still nascent game software industry. A few software games made use of the AdLib card even though hardly anyone possessed one of these cards. A turning point came when Taito of America, a major software publisher at that time, decided to put its support behind the AdLib card. People playing the Taito games were amazed at how much more fun a computer game could be with the special effects and music provided by the FM synthesizer on the AdLib card. Soon the word spread near and far that anyone who took games seriously absolutely had to buy one of these AdLib cards. The software game industry was revolutionized, and the sound card industry followed in quick pursuit.

AdLib, a Canadian company, held a virtual monopoly on the game card market from 1987 to 1989. AdLib wasn't the sole source of these sound cards. Competitors hoping to cash in on this new market showed up from all over, but they all made the same mistake: no one wanted to "share" this burgeoning market with AdLib. Since engineers have a very difficult time restraining their creative juices, a lot of "new and improved" sound cards appeared on the market. They were interesting products but were incompatible with the games already published for the AdLib card.

Game developers showed little interest in these new products. Each new card required laborious customization of the game software on the part of the game developers. This expensive programming effort scarcely seemed worthwhile, since AdLib sold many cards while the other manufacturers

collectively sold a relative few. This situation changed dramatically in November, 1989, when Creative Labs released its Sound Blaster card. Not just another competitor, Sound Blaster was different: It was fully AdLib-compatible—and more.

The Emergence of Creative Labs

Creative Labs wasn't exactly a new kid on the block. Founded by then-26-year-old Sim Wong Hoo, Creative Labs has become one of Singapore's success stories. Creative Labs began by producing memory cards for the Apple and high-speed cassette systems for the venerable TRS-80s. In 1983, they produced the Hanyu card, a milestone speech-synthesis card—and the first capable of simulating Chinese speech.

The origin of Sound Blaster can be traced to August, 1987, when Creative Labs released the Creative Music System (CMS), which synthesizes, or emulates, the sound of 12 different musical instruments. Ironically, the CMS was released at the same time that the AdLib was released in the United States. After much success in Singapore and other parts of the world, Creative Labs launched the Creative Music System in the U.S. in August, 1988 under the name Game Blaster. Unfortunately for Sim, he entered the U.S. market a year too late, after AdLib was already well on its way to market dominance.

On the surface, Game Blaster seemed able to compete with AdLib. It could play 12 instruments simultaneously in stereo, while AdLib could play just 11 instruments in monaural, single-speaker sound. The crucial factor proved to be competing music technologies. Game Blaster used AM (amplitude modulation) to simulate musical instruments, while AdLib used newer technology, pioneered at Stanford University and quickly picked up by Yamaha and other musical instrument manufacturers, called FM (frequency modulation) synthesis. You're already familiar with AM and FM, the techniques used to broadcast AM and FM radio signals. FM creates better instrument sounds than the older AM technique used by Game Blaster. As a result, Game Blaster, even in stereo, didn't sound as good as AdLib in mono, and Game Blaster quickly became a footnote in sound card history.

After the Game Blaster fiasco, Sim began work on a new project, code-named the Killer Card, that went on to become Sound Blaster. Sim went back to the drawing board after first interviewing the leaders in the game industry to find out what they wanted. This time, he decided to design a sound card that could be used with all the software designed for AdLib. Sim reasoned that just building a compatible card wouldn't be enough to take on AdLib, so he endowed the new card with extra features. He added a joystick port, a MIDI interface, and circuitry for digital audio. The card's

digital audio circuitry both recorded and played speech, music, and sound effects from disk. The Killer Card provided not just music, but added sounds like "man overboard," explosions, and all the booms, bangs, and zaps we now take for granted in arcade and computer games.

Building an AdLib-compatible card was a relatively easy task, since AdLib used the Yamaha 3812 integrated circuit, easily procured from Yamaha. Sound Blaster attracted game players for its built-in joystick port (AdLib required the second purchase of a joystick card and the hassle of installing it in your PC). And Sound Blaster became the musician's choice for its built-in MIDI controller. As you can see, Sound Blaster had all the ingredients for a commercial success. Compatible with the leading hardware and the installed base of game and music software, it offered more features and a better value, and—soon to become very important—it had proprietary digital audio technology that took some effort to copy.

You're probably wondering what happened to AdLib. They entered the sound card market at the perfect time and made a ton of money because of it. At first, AdLib wasn't very concerned about Creative Labs because AdLib had already designed their next generation sound card. Stereo sound and 12-bit digital audio, made it clearly superior over the new kid on the block, Sound Blaster. AdLib ran a very expensive advertising campaign, which stimulated considerable interest. Unfortunately for AdLib, there was one "minor" complication. They had nothing to sell. AdLib designed their sound card around the latest-and-greatest integrated circuits for sound, to be manufactured by a well-known semiconductor company. For over a year AdLib ran full-page advertisements in leading magazines, expecting to receive these crucial integrated circuits in the near future. As it turned out, by the time manufacture of these new circuits had been perfected, AdLib had run out of money.

THE EMERGENCE OF MULTIMEDIA

Creative Labs' success didn't go unnoticed, and both opportunities and storm clouds were on the horizon. The opportunities took the form of an effort by Microsoft, Tandy, Creative Labs, and others to define software and hardware standards for supporting multimedia on the PC. This effort culminated in November, 1990 when the Microsoft Multimedia Conference published the specifications for the Multimedia PC (MPC). This standard is now known as the MPC Level 1 specification.

MPC Standards

The MPC (Multimedia Personal Computer) standard was created by the MPC Marketing Council. The council consists of, and was formed by, a number of hardware and software vendors including Microsoft. The goal was to establish and license a standard that specifies the minimum requirements for an IBM PC-compatible computer to be considered multimedia-ready. To upgrade a typical PC to an MPC running Microsoft Windows 3 on a multimedia platform, the following must be added: a sound card, a CD-ROM drive, speakers, and Microsoft Windows software. The MPC council also specifies the minimum expected requirements for the computer's central processing unit (CPU), random access memory (RAM), video display, and disk storage.

The MPC logo is licensed only to hardware companies that sell complete multimedia PCs, to companies that provide upgrade kits that include both a sound card and CD-ROM drive, and to software companies whose software requires an MPC-compliant computer to run on. You most likely won't see the MPC logo on a CD-ROM drive alone. However, a CD-ROM drive does have to meet certain minimum criteria to qualify as an MPC-compliant drive. An interesting fact is that the very first MPC licensee is Media Vision.



NOTE: *You should be aware that the MPC Council does not actually test products. Originally, the manufacturer simply paid a fixed fee for the right to use the logo and claim MPC compatibility. This changed when the Level 2 specification was approved. Now, all members are issued a set of test programs which they self-administer to ensure compatibility. The MPC standard has become a stamp of certification, which makes it more valuable than before.*

There are currently two levels, or minimum performance standards, that have been established by the council: MPC Level 1, established in November, 1990 and MPC Level 2, adopted in May, 1993. The main difference between the two is performance—the Level 2 specifications require faster and improved hardware than Level 1.

When Level 1 was first adopted, the standard specified a minimum of an 80286/12MHz computer. The council, finally acknowledging that this computer platform was inadequate, increased the minimum requirements for Level 1 to a more realistic 80386SX/16 MHz computer. The current MPC specifications are summarized in Table 1-1. Feel free to buy better hardware than the minimum recommended for MPC Level 1 or 2. For example, a computer with an 80386 running at 40MHz is faster than either the 80386SX/16MHz or 80486SX/25MHz.

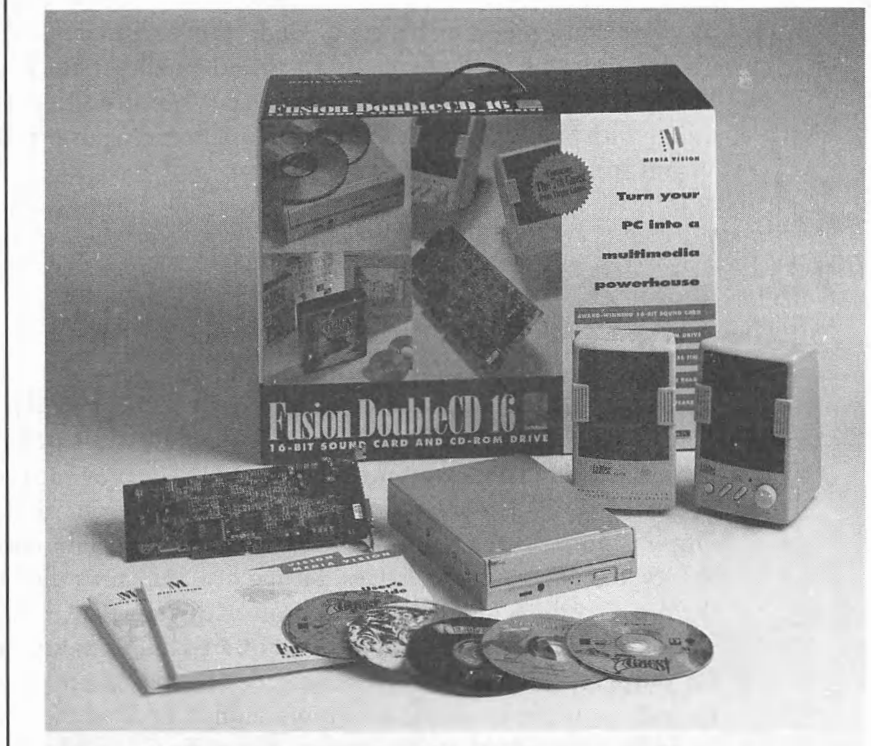
Requirements	MPC Level 1	MPC Level 2
CPU	80386SX/16MHz	80486SX/25MHz
System RAM	2MB	4MB
Disk Storage	30MB hard disk 1.44MB 3.5" floppy disk	160MB hard disk 1.44MB 3.5" floppy disk
Sound	8-bit digital audio, MIDI-in/MIDI-out, on-board analog mixer	16-bit digital audio, MIDI-in/MIDI-out, on-board analog mixer
CD-ROM		
sustained transfer rate	150KB/sec	300KB/sec
maximum average seek time	1000 ms	400 ms
Kodak Multisession Photo CD	No	Yes
CD-ROM XA	No	Yes
Video Display	VGA (640x480, 16 colors)	VGA (640x480, 65,536 colors)
Operating System Software	Microsoft Windows 3.1	Microsoft Windows 3.1
Recommendations	**MPC Level 1**	**MPC Level 2**
Sound		CD-ROM XA audio ability, support for IMA adopted ADPCM algorithm
CD-ROM	64KB on-board buffer	64KB on-board buffer
Video Display	VGA (640x480, 256 colors)	Delivery of 1.2 million pixels per second given 40% of CPU bandwidth

TABLE 1-1 *Key Elements of the MPC Specifications* ■

MPC Level 2 was introduced in May, 1993 to keep up with the growth in hardware capabilities. This specification defines the hardware platform for the next generation of multimedia PCs designed to play back a video clip in a 320-by-240 window on your screen at 15 frames (images) per second. The key difference between Level 1 and Level 2 is the performance expected from the CD-ROM drive. While Level 1 requires a sustained data transfer rate of 150KB/sec (150 kilobyte or 150,000 bytes per second), Level 2 requires at least a double speed drive with a sustained transfer rate of 300KB/sec. This means an MPC Level 2 CD-ROM drive can shove information—such as screen images—into your computer almost twice as fast as an MPC Level 1 drive. You'll definitely notice this speed difference when you page through a multimedia work. MPC Level 2 is fully backward-compatible with MPC Level 1, which means you can use all MPC Level 1 CD-ROM disks and multimedia software with an MPC Level 2 multimedia system.

The year 1991 will go down in history as the year that multimedia finally exploded on the scene. The convergence of many technological developments made this possible. Multimedia demands a lot from the computer. It requires a fast processor, such as a 80386 or better, a lot of hard disk capacity, a VGA (video graphics adapter) or better monitor, and a lot of RAM memory. By 1991, many computers possessed this hardware but not the requisite operating system software for true multimedia. The release of Multimedia Extensions for Windows 3.0 in August, 1991 gave tens of millions of PCs access to software that turned the PC into a multimedia platform. Figure 1-3 shows the contents of Media Vision's popular Fusion DoubleCD 16 Multimedia Upgrade Kit. This kit, which upgrades a computer

FIGURE 1-3
The Fusion DoubleCD 16 Multimedia Upgrade Kit



to the capability of running MPC Level 2 multimedia titles (CD-ROM discs with multimedia content), is available through both computer retailers and mass merchandisers. You can see in Figure 1-3 the Pro AudioSpectrum 16 sound card, an internal double speed CD-ROM drive, stereo speakers, and several CD-ROM disks. See Appendix A for additional details.

Before the MPC specification was drafted, the VCs (Silicon Valley jargon for venture capitalists) could smell a major opportunity. Video and audio technology had advanced rapidly but standards were not yet in place to make a major commercial splash. Once standards were in place, companies could buy without worry of too rapid technological obsolescence and incompatibilities. The situation resembled the earlier music world dilemma and the MIDI standard that evolved from it. With standards, the commercial prospects for video conferencing, multimedia, and the like could blossom. Jumping in too early would be fruitless, and jumping in too late could result in completely missing the boat. High above Silicon Valley, the VCs are always aloft, following the updrafts fueled by idle technical gossip in Silicon Valley cafes, always on the prowl for new opportunities. To readers unfamiliar with Silicon Valley as a hotbed of entrepreneurial activity, the Media Vision story may prove an eye-opener.

EMERGENCE OF MEDIA VISION

Media Vision was founded in early 1990 by Paul Jain (pronounced "Jan"), Russ Faust, and Tim Bratton. Jain and Faust had recently separated from Video 7, a video graphics adapter (VGA) display card company bought by LSI, Inc. and merged with their chip operations to form Headland. Opportunities in the VGA market had faded, and Jain and Faust were on the lookout for new challenges. Sitting around Jain's dining room table in the Berkeley hills, Jain, Faust, and Bratton discussed an idea that caught fire. The idea was to create a company that offered high-quality video technology, for purposes such as video teleconferencing, based on emerging standards for video compression and decompression (a process that squeezes video so it can be transmitted across existing phone lines). In May, 1990 a five-page summary of the concept was completed. Paul Jain, already known to the venture capital community, had $1 million of venture capital in his hands one week later. On May 19, Media Vision was incorporated, and by the end of May, the first office opened. As you will see, this video background has played an important role in the Media Vision story and will play an even bigger role in the future.

The New Focus: Multimedia

An interesting transformation took place during the second half of 1990. The Media Vision game plan changed as the founders realized that the new-fangled technology called "multimedia" was a much bigger opportunity than video technology and that sound was going to come out of the racing blocks first. Media Vision's new mission was to popularize multimedia solutions by offering those solutions at affordable prices. While the Media Vision founders had more than ample experience in video, they had virtually no experience in sound or music. But this is the direction in which they steered.

The Multimedia Conference

Microsoft led in the definition of the Multimedia PC, and in the fall of 1990, Media Vision made the important decision to join in with this project. In November, 1990, a prototype of the Pro AudioSpectrum sound card was used to demonstrate a multimedia personal computer at the Microsoft Multimedia Conference. This prototype was the first sound card to fully adopt the MPC Level 1 specifications, supporting MIDI, CD-ROM Red Book audio (the same audio put on an audio CD), 8-bit digital audio, and an analog mixer that blends together the various audio sources. The demonstration caused a stir among the developers at the conference, who flocked to sign up with Media Vision.

This coup by Media Vision was accomplished in classic Silicon Valley fashion. The first three prototype sound cards and accompanying software were designed and built in just 60 days by the combined efforts of Bryan Colvin, Dan Gochnauer, and Doug Cody, all veterans of Video 7. Media Vision's prowess at performing engineering feats in short order has proven to be one of their important strengths.

Among those stunned by this demonstration and outpouring of developer support were representatives of Creative Labs, who up to that point may well have been unaware of the efforts of this startup called Media Vision. Creative Labs reacted swiftly to the Media Vision threat. Media Vision demonstrated their product on Wednesday. On Thursday, Creative Labs, which didn't yet have an MPC sound card, responded in the only way they could to vie for the developers' attention: They handed out a Sound Blaster package to each of the 800 to 900 attendees at the conference.

The Media Vision Strategy

Paul Jain applied his experience as CEO of Video 7 to the benefit of Media Vision. Earlier, Video 7, Paradise, and other industry leaders had taken a

very aggressive stance in driving down the price of VGA cards to gain market share. These companies succeeded in shrinking a circuit board full of components into just a few integrated circuits, reducing the manufacturing cost dramatically. Unfortunately, this reduction resulted in VGA cards becoming a commodity product for which there was little profit to be made. Jain had to come up with a strategy to prevent this same fate from occurring again, this time in the new sound card industry.

Media Vision embraced a broad diversification strategy. The plan—once the decision was made to switch from video technology to audio technology—was to start as the premier supplier of state-of-the-art sound cards, multimedia systems, and chip sets, but then rapidly to diversify into other business areas. The first step was to offer a high quality MPC-compatible sound card. Next, they would use their design and manufacturing experience to lead the industry in reducing the sound card to a small chip (integrated circuit) set. By reducing the parts count, the number of components on the sound board, the overall cost could be driven as low as possible. Media Vision would expand the market and then grab market share by lowering their price.

An important part of this strategy involved avoiding cannibalization by other companies making low-cost *clones* (copies) of their chip set, as had occurred in the video graphics adapter industry. The creation of standards that made it possible for the sound card industry to blossom also made it easier for competitors to jump in. Knowing that it was impossible to block competition in retail distribution, Media Vision planned to aggressively license their chip set to manufacturers of PCs and even competing sound cards. Media Vision would first prove the viability of their chip set by using it in their own retail product. Once proven in the marketplace, the chip set would be relatively easy to sell to other manufacturers.

Several benefits arise from spawning one's own competition. If Media Vision can make its chip set the industry standard, it can evolve the technology—keeping chip clone manufacturers off balance—and can charge a premium for its chip set. This strategy has proven very effective for Intel, which now sells a single CPU chip for hundreds of dollars. The Media Vision strategy has already been successful. At this time, Media Vision sells boards or chip sets to at least 56 companies, and this business is expected to account for about 30 percent of revenue. Since Creative Labs and Media Vision together control an estimated 80 to 90 percent of the IBM-compatible sound card market, Media Vision's Spectrum chip set must be responsible for at least half of the 10- to 20-percent market share that neither Media Vision nor Creative Labs controls directly.

The next stage of the Media Vision diversification strategy is to move into the video realm, beginning with selling video cards. Once the video product concept is proven, video chip sets will be sold to other manufacturers.

The Pro AudioSpectrum Design

The Media Vision engineers designed the Pro AudioSpectrum card to primarily satisfy the MPC specification. Having surveyed the software game market, Media Vision saw that compatibility with the music abilities of AdLib, the dominant game card at that time, was important. As mentioned before, since the AdLib card used the industry-standard Yamaha chip for FM synthesis, compatibility was easy to achieve. Pro AudioSpectrum not only came loaded with features, but boasted a much better-sounding digital audio and a much better mixer than the other non-MPC-compliant sound cards at that time.

Since Sound Blaster hadn't caught on at this time, Media Vision wasn't much concerned that Pro AudioSpectrum couldn't play games that featured digital audio for Sound Blaster. In fact, hardly any games used digital audio for special effects at that time. Figure 1-4 shows Media Vision's first advertisement geared toward the business community. It displays a small xylophone—a child's toy—in an attempt to characterize the competition as mere toys in comparison to Pro AudioSpectrum, Media Vision's first sound card.

Potholes in the Road to Success

Success doesn't come easily in a competitive market, as Media Vision can testify. Challenges they've encountered include shortages of critical components, slippage by Microsoft in the delivery of the multimedia extensions to Windows, misreading of the marketplace, technological road blocks, and law suits.

The Cutting Edge of Technology

Sometimes trying to deliver leading edge technology has its risks. Media Vision aggressively designed state-of-the-art components into their sound card to ensure great sound quality. Unfortunately, the manufacturer of these chips was slow getting these components into volume production. In fact, the supplier had to launch a worldwide search of their offices to provide Media Vision with enough chips to manufacture their first 100 sound cards. These cards were desperately needed as an evaluation units, to go into the

FIGURE 1-4

Media Vision's first advertisement to the business community emphasized high fidelity sound and MPC compliance.



hands of software developers, distributors, or key OEM (original equipment manufacturer) accounts. In a situation like this, cutting-edge technology becomes "bleeding-edge" technology.

Shrink That Baby

Media Vision's manufacturing problems weren't over once they gained an ample supply of components essential for manufacturing the first Pro AudioSpectrums. Another engineering challenge arrived, and another set of engineering talent had to swing into action. The job now was to reduce the cost of the sound card as quickly as possible. The cost is reduced by replacing the many discrete components on the circuit board with a few custom-built ASICs (application specific integrated circuits) that do the same thing in one very large integrated circuit. Designing an ASIC is difficult, time consuming, and expensive. Each ASIC consists of tens of thousands of discrete gates, the "atoms" or fundamental elements of digital electronic circuits, and they must be combined flawlessly. The design is executed on a PC workstation that simulates, by running a software program, how the chip will run once it is manufactured in a "silicon foundry."

Using custom-built ASICs in a circuit board like the sound card has an enormous advantage. The cost of making a few ASICs and soldering them onto a circuit board is much less than the cost of buying and mounting onto a circuit board many little components. In addition, circuit board reliability is dramatically improved.

The ASIC design needed to be developed as soon as possible, because the sound card's circuit board simply cost too much. The pressure on Media Vision engineers couldn't get any worse. Each batch of chips made to test a design costs a cool $10,000. The slightest mistake ruins the batch, and it's hard to hide $10,000 invoices from the boss.

The first Media Vision boards were packed with components, and even the casual observer could see that these four-layer circuit boards must have been expensive to manufacture, possibly too expensive. The design was no accident, though. It was part of Media Vision's strategy to become a dominant player in the sound card industry by being an early entrant with a quality MPC product. Media Vision, experts in miniaturization and mass production, felt confident they could drastically reduce the number of components and the consequent cost of the board. After some time, the Pro AudioSpectrum board was covered with Media Vision's own proprietary ASIC chips, and the manufacturing costs had dropped low enough that Media Vision could begin lowering the price.

The Big Slip

As mentioned earlier in "The Pro AudioSpectrum Design," Media Vision made a thoughtful decision to be completely MPC- and AdLib-compatible. They reasoned that lack of Sound Blaster compatibility wouldn't be a

problem. Media Vision intended to jump into the Windows Multimedia market as Multimedia Extensions for Windows was introduced and businesses adopted multimedia for presentations and training. In the Windows market, compatibility with the Sound Blaster card's digital audio wasn't so important, since there would be universal software drivers included with the Windows Multimedia Extensions that would isolate the hardware (sound card) from the software (games), providing a level playing field to new players like Media Vision.

Unfortunately for Media Vision, an enormous fly dive-bombed into the ointment. Microsoft slipped their ship date for Multimedia Extensions for Windows from April of 1991 to August of 1991. Media Vision had to either ship a product that would run under DOS or stand in the sidelines while Creative Labs continued to steamroll over the market. Media Vision decided to go into battle, even though Microsoft's multimedia extensions weren't ready, and shipped the Pro AudioSpectrum with software for DOS only in April of 1991.

Media Vision Launches Pro AudioSpectrum

Media Vision shipped their first card, the Pro AudioSpectrum, in April, 1991, and it met with immediate success. Creative Labs responded, shipping their MPC-compliant Sound Blaster Pro in quantity by August. Sound Blaster Pro maintained full compatibility with the earlier Sound Blaster, of course, and could boast of several refinements, including stereo FM music. These two sound cards were similar with identical 22-voice FM synthesizers, joystick and MIDI ports, and 8-bit digital audio, although the digital audio wasn't compatible. The Pro AudioSpectrum seemed able to hold the advantage, having superior sound including lower noise digital audio and a superior audio mixer. The Pro AudioSpectrum's superior digital audio didn't come without drawbacks, as you will soon see.

Media Vision soon discovered that the game market was very, very big indeed—in the short term possibly bigger than the MPC market that Media Vision was targeting. Media Vision then decided to pursue a two-track approach. The Pro AudioSpectrum sold well, but a low-cost sound card, to be called the Thunder Board, was needed to go after the game market. It was time for another crash engineering project. In short order, additional "game-compatible" integrated circuits were created that made it possible to bring out a Sound Blaster-compatible game card. In July, 1991, less than three months after the Pro AudioSpectrum card was shipped, the Thunder Board was shipped.

Shot Down by Wing Commander

The two-track approach didn't last for long. Unfortunately for Media Vision, a game called Wing Commander, shipped shortly after the Pro AudioSpectrum came out, had become very popular. People were enchanted by the digital audio sound effects and recorded voices that made Wing Commander the most exciting game of its time. The popularity of this game, which ran on the Thunder Board but not on the Pro AudioSpectrum, convinced Media Vision that their two-track approach wasn't correct—they had to add game compatibility to all their sound cards. The game chips developed for the Thunder Board were added to the Pro AudioSpectrum, and in March of 1992 this new version hit the market with the name Pro AudioSpectrum Plus. It could behave as either a Pro AudioSpectrum card or as a Sound Blaster card. The folks at Media Vision thought they could now catch their breath, but Creative Labs had set up fortifications in anticipation of this Media Vision assault.

The IPO Race

Media Vision had to shift into overdrive. The business plan stipulated that Media Vision generate significant revenues by the second quarter of 1992, culminating in an *initial public offering* (IPO) of stock in the 4th quarter of 1992. If the second quarter target was missed, the planned IPO would be put at risk. Without this cash injection it might be impossible to compete with Creative Labs. This plan meant that an entire family of products had to be launched by April. The pace was furious, but by now Media Vision had made crash projects part of their routine.

In April, Media Vision simultaneously launched the Pro AudioSpectrum 16 (similar to the original Pro AudioSpectrum but with CD-quality 16-bit digital audio), the Pro 16 Multimedia System, the CDPC integrated business multimedia systems, and the AudioPort portable sound device.

Blasting Through the Defenses

As you've probably suspected, the folks at Creative Labs weren't exactly lounging in their hot tubs drinking iced cappuccinos. In fact, Creative Labs had already forged a counterstrategy for defending themselves against the onslaught of Sound Blaster clones, with a probable eye toward Media

Vision's Thunder Board. In January, 1992, a half-year after the Thunder Board was launched, Creative Labs released an updated version of their software developer's toolkit that had an interesting "feature." The developer's toolkit is an instruction book with program examples and a "bag" of little software programs collectively called a "library." Many software developers embed this library into their game or other software application to make use of the sound card. Unbeknownst to Media Vision and the software developers, Creative Labs' latest developer's kit came with a new feature: When a game created with the developer's kit library was run, a Creative Labs' software routine would check to see whether the sound card was a "true" Sound Blaster or a "clone." The software library passed a "key" to the sound card, and if the sound card didn't compute and return the correct value in response, the user's PC would freeze.

The little trick in the developer's library lay dormant until a new generation of games, developed with this version of the software developer's toolkit, began to trickle into the hands of gamers in July or August of 1992. The situation was not pleasant for Media Vision, but fortunately, the major software developers had written their own library routines—which of course lacked this trap—so their games ran fine. The folks at Media Vision weren't happy about this new problem, but engineers love challenges. Media Vision was stymied for a week or two, but after the problem was handed over to an engineer who had a pet interest in encryption technology, the riddle was cracked in a couple of days. A software patch that *patched around* (disabled) the offensive piece of software in the game was posted on the Media Vision bulletin board and made available to anyone experiencing problems with their game software. The spat was now escalating, though, and Creative Labs would soon initiate a lawsuit against Media Vision.

See You in Court

Before Media Vision could launch its new products, Creative Labs sought a court injunction against Media Vision to stop Media Vision from shipping their products. Creative Labs claimed damages based on allegations of infringement of copyrights, misappropriation of trade secrets, and unfair competition based on false advertising. This lawsuit occurred not long after Media Vision scaled the technological hurdle Creative Labs had set up, and it was probably part of a previously laid out defensive strategy. Unfortunately, high technology firms these days use the courtroom as an arena to bash their competitors. In this case, Creative Labs had recently gone public and was flush with cash, while Media Vision had not yet gone public and was quite vulnerable to any sort of legal difficulty. A "noisy" dispute, with the threat of an injunction that could sink the company, tends to discourage

potential investors. Creative Labs and Media Vision agreed upon a settlement in August of 1992 whereby Media Vision would acquire a license to incorporate Sound Blaster compatibility into the company's products through August, 1993 in exchange for a $1.25 million payment. Media Vision has the option to renew this license for three one-year periods at a cost of $750,000 in the second year and $500,000 in the third and fourth years.

Happy Endings

Obviously the Media Vision story must have a happy ending. In November, 1992, with sales targets met and legal problems tidied up, Media Vision had a successful Initial Public Offering, raising $46 million. Creative Labs still had the lead in market share, but now Media Vision and Creative Labs were on even footing for further competition. Both companies enjoyed healthy treasury coffers and could tap the financial markets for further cash infusions. In fact, in April, 1993, Media Vision had a secondary stock offering that pulled in an additional $31.5 million.



TIP: *For those of you who follow the stock market, you'll find Media Vision listed on the NASDAQ with the symbol MVIS. Their rival, Creative Labs, is listed on NASDAQ with the symbol CREAF.*

Spending the War Chest

Media Vision and Creative Labs began to aggressively acquire other companies that could contribute leading-edge multimedia and video technologies. Both companies have already released their first-generation video products, with the promise that more exciting products will follow.

Most significant among Media Vision's latest activities is the acquisition of Pellucid on June 1, 1993 for about $15 million in Media Vision stock. Pellucid has exciting technology but limited sales to date. They were selling a three-dimensional graphics card for the PC, capable of showing all sides of an object as it rotates in space. This technology was developed while the engineers and executives were still employees of Silicon Graphics Inc. (SGI). (In case you haven't heard of SGI, this is the company that makes the graphics workstations used to create movie special effects such as those seen in *Terminator 2* and *Jurassic Park.*)

Without adding special video hardware to the PC, the typical video application fills a relatively small window on the screen, runs at no more than 15 frames per second, and is about as exciting as a 1950s-vintage

black-and-white television with a round picture tube. Pellucid technology enables Media Vision to ship video products offering *full-motion video*—30 frames per second—which can fill the entire PC screen with high-definition, 24-bit color graphics. Although this technology is available today on the Apple Macintosh, it has not been widely available on PC-compatible machines. Pretty soon, thanks to these advanced video cards, your computer's video display will make the living room TV look lifeless in comparison.

New Challenges

In an industry with so much growth potential, it's not surprising that new challenges constantly appear. Microsoft, seeing what a gold mine hardware niches can be—making over $200 million a year in very profitable mouse sales—introduced the Microsoft Sound System. Fortunately for Media Vision and the other players in this industry, Microsoft has missed the mark entirely by introducing a sound card that has appeal to only the business market, still a relatively small part of the overall market. Ironically, even though Microsoft fostered the Multimedia Personal Computer (MPC) standard, their own sound card doesn't adhere to it and is useless for game play.

Media Vision began selling their Spectrum and Thunder chip sets for sound in August, 1992, and these chip sets have sold well. Media Vision does face competition in chip sets from both Creative Labs and Analog Devices, but towers over its competition. Recently, IBM has announced its chip set will be available soon. Media Vision's biggest challenge, though, continues to be their long-time—since 1990—nemesis, Creative Labs.

Battling It Out with 16-Bits

Near the close of 1992, Creative Labs launched their first 16-bit digital audio sound card, the Sound Blaster 16 ASP (Advanced Signal Processing), which was designed to compete against Media Vision's Pro AudioSpectrum 16. The Sound Blaster 16 ASP features compression and decompression built into the hardware and an optional wavetable daughterboard. *Wavetable synthesis* is a technique for creating very realistic musical instrument sounds by using actual samples of the genuine instrument. The Sound Blaster 16 ASP has audio compression and decompression capability on the sound card in *real-time*—keeping up with the sound as it is heard—and impressive instrument sounds, courtesy of the wavetable synthesis technology.

Unfortunately for Creative Labs and fortunately for Media Vision, this card simply costs too much to become popular. The fact that the digital audio of the Sound Blaster 16 ASP is noisier than the Pro AudioSpectrum 16 when playing games doesn't help either. In any case, the Sound Blaster 16 ASP hasn't had

much success competing against the less-expensive Pro AudioSpectrum 16. In the second quarter of 1993, Creative Labs prepared yet another assault on the Pro AudioSpectrum 16, this time with a less expensive version of the Sound Blaster 16 ASP. This sound card is called the Sound Blaster 16. Creative Labs removed both the "ASP" from the name and the ASP integrated circuit that performs compression.

Media Vision hasn't been standing still in the face of this new competition, bringing out both high-end and low-end products based on the Pro AudioSpectrum 16. In May, 1993, Media Vision introduced the "studio" version of Pro AudioSpectrum 16, called the Pro AudioStudio 16. This card is especially attractive for demanding audio applications, including a quiet mixer, low-noise digital audio, and special shielding that makes the card as a whole ultra-low in noise. It is accompanied by a powerful suite of software packages that includes speech recognition software for controlling your computer by voice commands. This software, incidentally, is available to all Pro AudioSpectrum 16 owners as an upgrade. See Appendix A for more details about this upgrade package.

In late June of 1993, Media Vision introduced its Pro Audio 16 Basic to counter Creative Labs' recently introduced the Sound Blaster 16. The Pro Audio 16 Basic, which is essentially identical to Pro AudioSpectrum 16 except that it lacks a CD-ROM interface and is packaged with only a minimal software suite, has a suggested list price of just $199. This price undercuts both the Sound Blaster 16 ASP and Sound Blaster 16, and puts pressure on the Sound Blaster Pro game card as well.

In August, 1993, Media Vision ensured its title as king of the hill in 16-bit sound cards by announcing the Pro AudioStudio 16XL, the ideal sound card for turning your PC into a professional music studio (see Figure 1-5). This card is positioned directly against the Sound Blaster 16 ASP, but it's less expensive and has superior capability to boot. The Pro AudioStudio 16XL comes with a Korg wavetable synthesizer containing genuine musical instrument sounds with chorus and reverberation effects built in. In the picture you can see the back side of the Korg synthesizer daughterboard which is attached to an otherwise standard Pro AudioStudio 16 sound card. The Pro AudioStudio 16XL has a software suite similar to that of the Pro AudioStudio 16 except the inclusion of a new version of the Passport Design's high-end Trax MIDI sequencer that features standard music notation. The Pro AudioStudio 16XL is scheduled to ship in the fourth quarter of 1993.

As this book goes to press, Media Vision continues to be the dominant player in 16-bit sound cards but is striving to gain market share in the lower end of the market. Creative Labs, anchored by its inexpensive 8-bit Sound

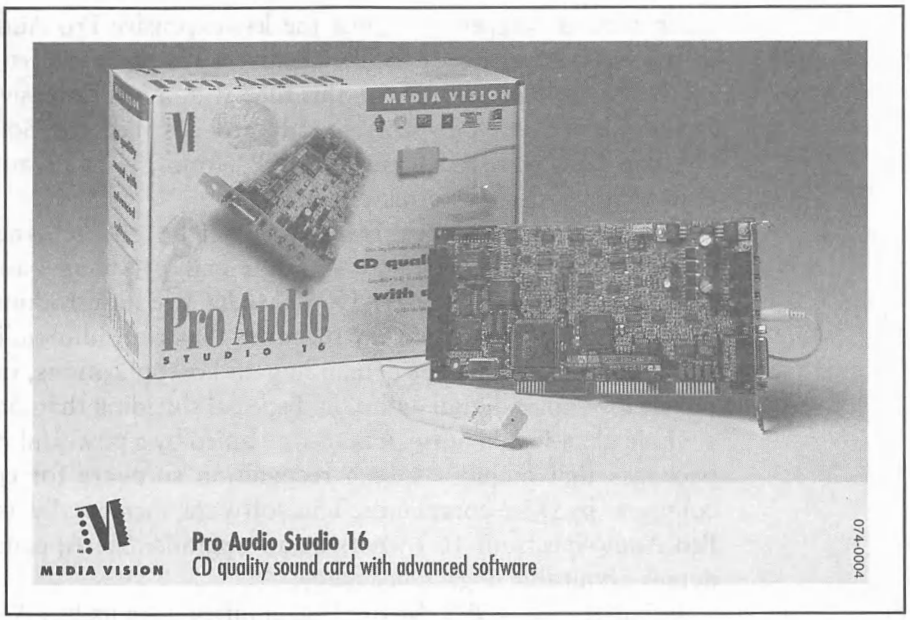


FIGURE 1-5
Media Vision's Pro AudioStudio 16XL high-fidelity sound card with wavetable synthesizer

Blaster, continues to dominate the low end of the market but is looking to capture more of the 16-bit market. Stay tuned for the next episode in this interesting saga.

MEDIA VISION'S FUTURE

Media Vision is pushing to quickly diversify into video and multimedia. Media Vision today sells sound chip sets, sound cards, and complete multimedia systems that include a sound card, CD–ROM drive, and multimedia titles (multimedia software shipped on CD-ROM). Media Vision has also introduced multimedia kits that comply with the MPC Level 2 specification. These kits contain a fast CD–ROM drive that improves the response time of interactive multimedia applications, such as CD-ROM-based encyclopedias. Since the Pro AudioSpectrum 16 and Pro AudioStudio 16 sound cards already exceed the MPC Level 2 specification, only the accompanying CD–ROM needed to be upgraded. Media Vision has recently begun to push into video technology, workstation-quality graphics accelerator add-in boards, and multimedia publishing. Appendix E provides more detail, but we'll give you a preview here.

Media Vision will license video compression/decompression technology, called Captain Crunch, to third parties. Captain Crunch allows video on a 386-or-better PC and a VGA monitor. It can be built into VGA cards at little additional cost. Media Vision also sells a video capture board called the Pro MovieStudio, the first add-in board to offer real-time compression of video images for under $450. The technology underlying the Pro MovieSpectrum is embodied in the two-chip MotiVE video chip set, which is also available for purchase. Microsoft has incorporated a portion of the MotiVE softare into their Video for Windows software.

With the acquisition of Pellucid, Media Vision is bringing to the marketplace the next generation in PC graphics at an affordable price. This year, taking advantage of technology from Pellucid, Media Vision will introduce a line of Pro Graphics accelerator add-in boards. These video boards offer 24-bit true color with fine resolution and very high performance, allowing you to create multimedia effects like rotating three-dimensional objects and *morphing*, where an object changes shape. This can be seen in the Exxon television advertisement where a charging tiger is transformed into a sleek sedan.

Recently, Media Vision established a group to publish CD-ROM multimedia software, which is a potentially more lucrative business area than selling multimedia hardware. Two key executives have been hired: the founder and chief executive officer of Warner New Media and the former vice president of Microsoft's multimedia division. The publishing group will both develop titles in-house and license them from outside developers.

Media Vision is doing its best to advance the state of the art in multimedia. In this new frontier of multimedia computing, the traditional boundaries dividing audio and video, professional-caliber production facilities and consumer equipment, business data processing and personal computing, and even what is "work" and what is "fun," are fading away. This is well illustrated by Media Vision's October 1993 announcement of the Memphis multimedia upgrade system that transforms a desktop personal computer into a complete multimedia "theater" suitable for home, school, or office (Figure 1-6).

The Memphis upgrade system consists of a 16-bit sound card that installs in your computer, a single cable that runs from the back of the computer to the Memphis chassis, and detachable speakers that can be moved up to six feet from the chassis to give excellent stereo effect. The chassis contains the controls you need as well as an audio CD which can be played even when the computer is turned off. The Memphis is designed for ease of use and installation. You can install the sound card yourself or have your computer

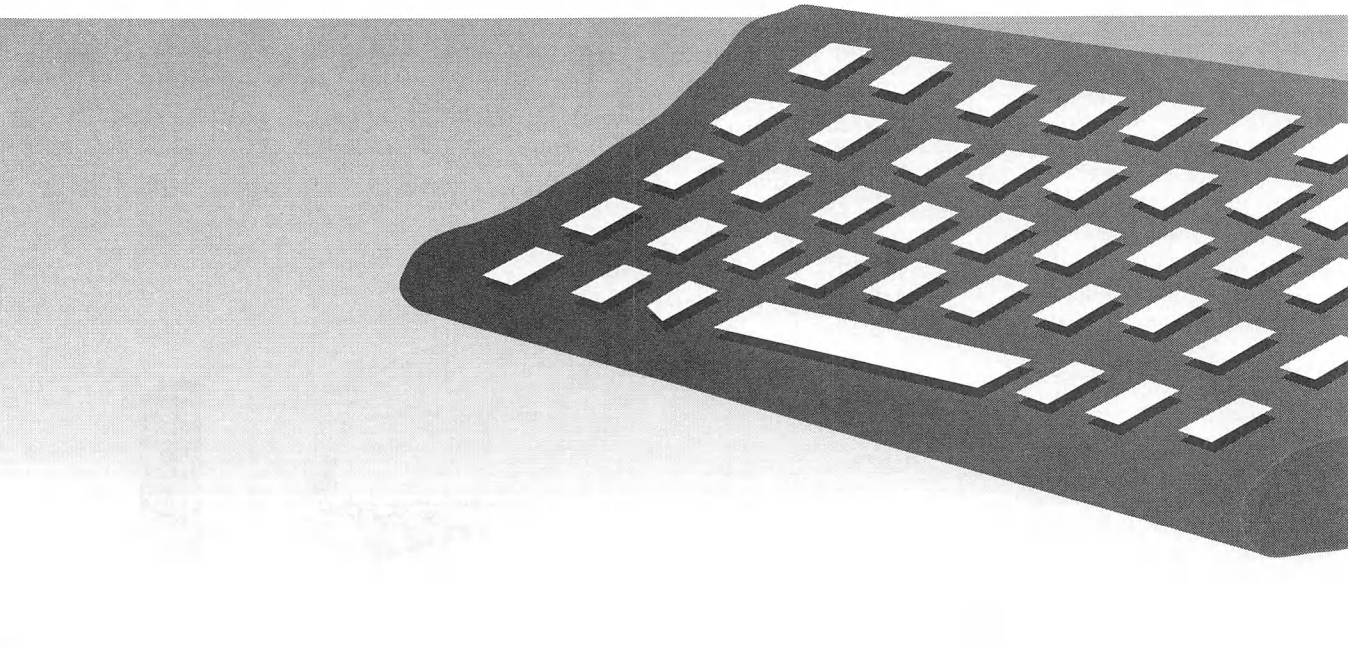


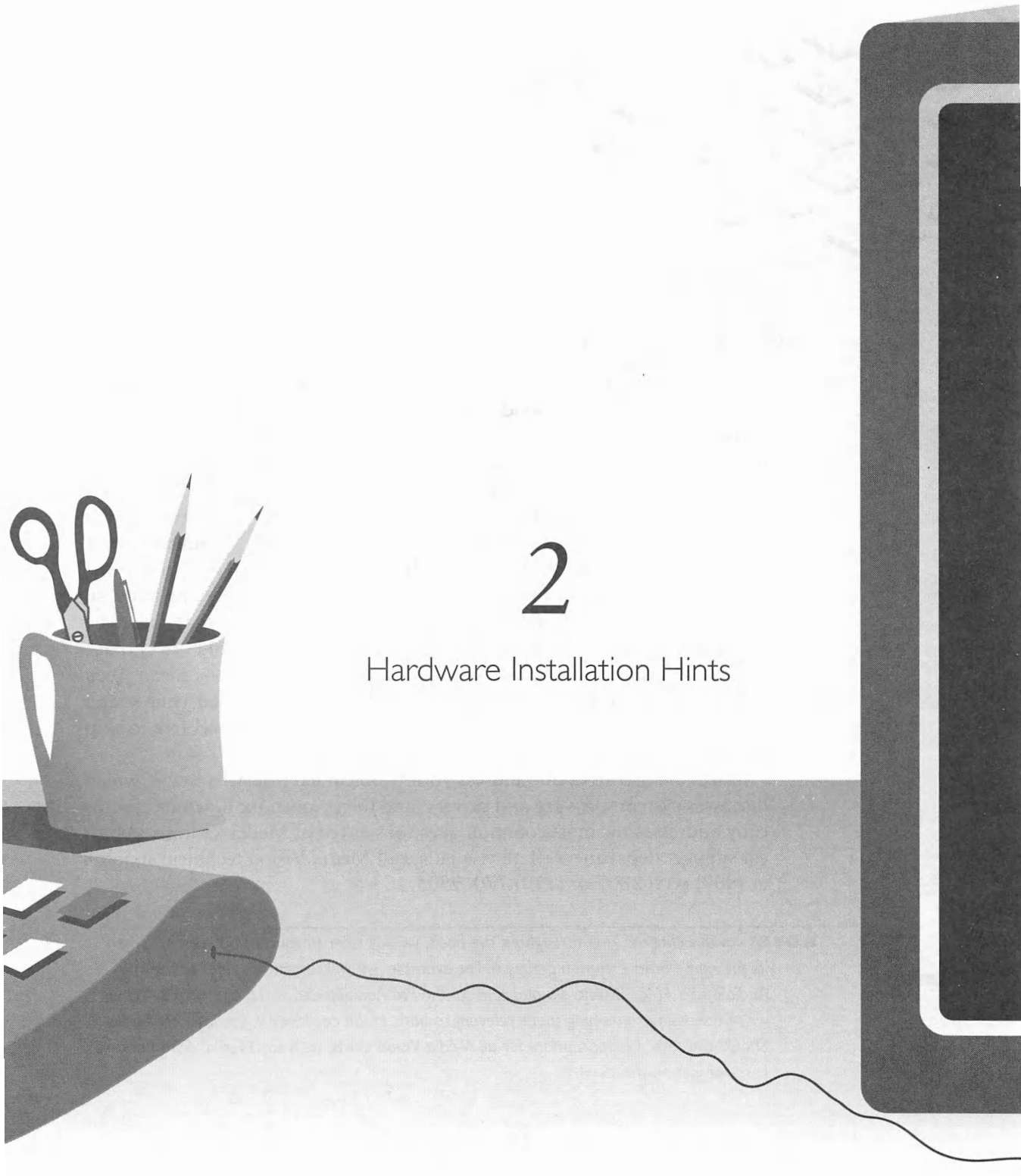
FIGURE 1-6 *The Memphis Multimedia upgrade system transforms an ordinary PC into a multimedia theater*

dealer install the Memphis sound card into your computer. Once the sound card is installed, you can take home the Memphis upgrade system, plug in the Memphis console and speakers, and enjoy multimedia with the same ease that you now enjoy music from your stereo system.

It's not too farfetched to imagine that your next copy of this book will be available on paper and as a silvery plastic CD-ROM disk, from which the authors will personally welcome you to the wonderful world of sound and multimedia from your family room's multimedia theater.

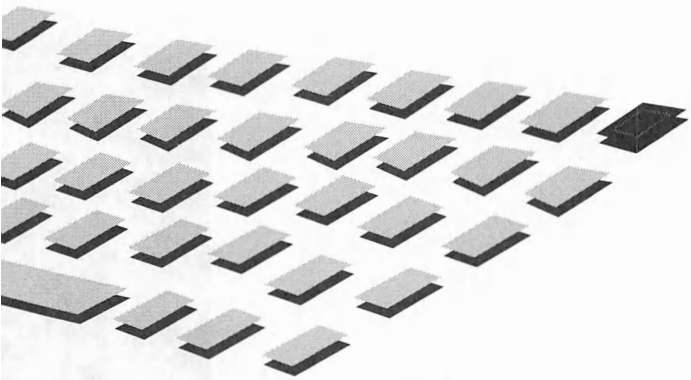






2

Hardware Installation Hints



THIS chapter is essentially a miniature encyclopedia on installing and troubleshooting your sound card. The installation of your sound card software is fully automated by the Media Vision Quick Start installation program. Since this automatic installation is successful over 95 percent of the time, you're probably among the lucky majority who can skip this chapter. If you are encountering installation problems, or must reconfigure the sound card to resolve a conflict with another device you've added to your computer, you should definitely read this chapter. The goal is to give you a single source of information, complete yet not technically overwhelming, so you'll have the background to quickly untangle problems that might be encountered. If you're tired of hearing about "DMA this" and "IRQ that" because you don't quite understand what these abbreviations mean, then this chapter is for you. If you've already successfully installed your sound card, and you're in a rush to enjoy your sound equipment, feel free to skip this chapter.

If this chapter does not address your problem, consult Chapter 3, which discusses system software and drivers, and then Appendix B, which specifically addresses the most common questions asked of Media Vision's technical support department. If all else fails, call Media Vision technical support at (800) 638–2807 or (510) 770–9905.



NOTE: *In this chapter, and throughout the book, we will refer to your sound card by either its full name or its common acronym. For example, we will sometimes refer to the Pro AudioStudio 16 as* Studio 16 *and refer to the Pro AudioSpectrum 16 as* PAS 16. *When we're discussing something that's relevant to both 16-bit cards, we'll just say* Pro Audio. *Should the topic be appropriate for all Media Vision cards, we'll say* Media Vision sound card, *or just* sound card.

CONNECTORS AND CHIPS

Before starting with the hardware interfacing lesson, we're going to describe the external connectors you use to attach sound devices such as a microphone, speakers, or stereo. Then we'll describe the internal connectors and jumpers. Further on in this chapter, we'll show you a picture of the sound card circuit board and point out some of the more important *chips* (also known as *IC*s or *integrated circuits*) on the card. Knowing which chip does what isn't so important, but this map of the chips provides a convenient starting point for describing the breadth of functions provided by the sound card.

External Connectors

Figure 2-1 shows an example of external connectors, in this case on the Pro AudioStudio 16. All the external connectors shown in Figure 2-1 are accessible from the back of the computer after the card has been installed. These four connectors are for the Studio 16 only. The PAS 16 has only three connectors: In, Out and Microphone.

If you have one of Media Vision's completely integrated multimedia systems, such as the CDPC or CDPC XL, Figure 2-1 will not be helpful. These integrated multimedia systems have a special version of the sound card that, along with the speakers, microphone, and CD-ROM, are contained in their own console external to the computer. For these systems, the connectors are either found in other locations or are hidden inside the console.

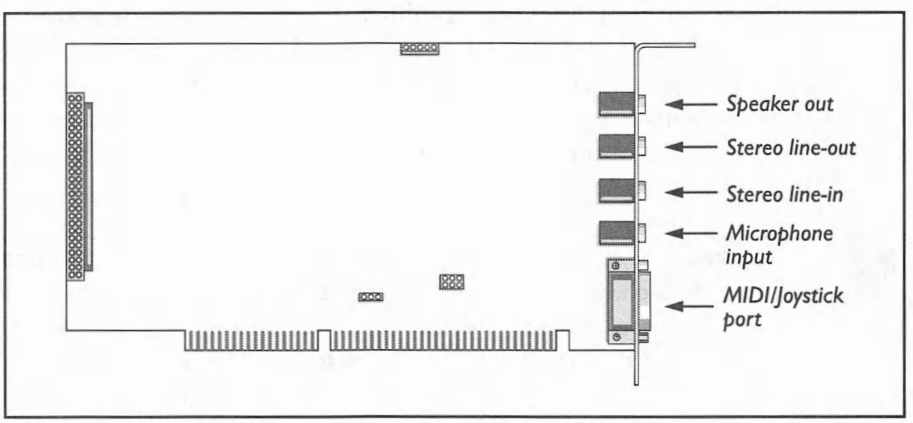


FIGURE 2-1 *External connectors on the Pro AudioStudio 16*



NOTE: *You should consult the Media Vision installation guide that accompanies your sound card for details that may be specifically appropriate for your card. This chapter contains installation instructions that may only be appropriate for the newer Pro AudioStudio 16 or Pro AudioSpectrum 16 cards.*

The connectors on your sound card that are accessible after the card has been installed, from the outside of your PC, are described in the following sections.

Speaker Out

You can enjoy listening to your sound card simply by plugging headphones or speakers into the Speaker Out connector. The card's output amplifier delivers up to 2 watts per 8 ohm speaker (4 watts into 4 ohm speakers), giving crisp sound even with small speakers. The Speaker Out connector is a standard 1/8" (3.5 millimeter) stereo phono jack. The same sized jack is used for Stereo Line-Out, Stereo Line-In, and Microphone Input.

Stereo Line-Out

Pro AudioStudio 16 is the first member of the Media Vision sound card family to have a Stereo Line-Out phono jack. Stereo Line-Out connects your sound card to an external stereo amplifier. Stereo Line-Out delivers an unamplified *signal,* a fancy term for sound or information that's transmitted as electricity. The advantage of an unamplified signal is that it is very low in *noise,* extraneous sounds that sneak in when you amplify a signal. The same is true when you yell: harsh sounds are unintentionally added when you push your "audio system" to its limits. If you're routing the output of your sound card to an external amplifier, you don't need the extra amplification provided by Speaker Out, so you're better off sending the purer sound from Stereo Line-Out. If you have *self-powered* speakers (speakers that have a built-in amplifier powered by either batteries or a household electrical outlet), you're best off using Stereo Line-Out and avoiding the unnecessary amplification—and consequent noise—of Speaker Out.



NOTE: *The speakers included with most home stereo systems receive all their power from the two wires or the cable that connects the speaker to the stereo. With the growing popularity of self-powered speakers, which contain built-in amplifiers, the conventional type of speaker is frequently referred to as an unpowered speaker to distinguish it from the self-powered variety. Self-powered speakers first became common as an accessory for Sony Walkman-like portable cassette or CD players which have only enough power for headphone use. Refer to Chapter 12 for more information on speakers.*

Stereo Line-In

Stereo line-in lets you bring in sound from other audio equipment such as a stereo, CD player, radio, or tape recorder. You can then mix this sound with your sound card's microphone input as well as sound created by the sound card, such as music and special effects.

Microphone Input

When buying a microphone, check the packaging to ensure it has an *impedance rating*—an audio equipment compatibility measurement—of between 600 and 10,000 ohms. This means you can use virtually any dynamic microphone—a common, inexpensive type of micrrophone—or the more expensive condenser microphone with your sound card. Some Media Vision products, such as the Pro AudioStudio 16, include a microphone that you can plug into this connector. This jack is a 1/8" *mono* (monaural) mini jack. The other mini jacks are stereo.

The MIDI/Joystick Port

This connector has a split personality: it's both a MIDI and joystick port. The sound card industry discovered that an inexpensive way to connect MIDI keyboards, musical instruments, and synthesizers to the PC was to take over the spare unused pins on the joystick connector. Implementing a MIDI port in this fashion has become an industry standard technique. The MIDI/Joystick port is the same 15-pin connector used on the original IBM game adapter card, which is found on virtually every IBM-compatible computer sold today.

To connect MIDI equipment to the PC, you must purchase Media Vision's inexpensive MIDI Mate MIDI connector box. The MIDI Mate's cable is plugged into the MIDI/Joystick port on the sound card, and the MIDI equipment is plugged into the MIDI Mate box (see Figure 2-2). The joystick then attaches to the MIDI Mate Box, so you can continue to steer your way through games and virtual reality universes. You can connect two joysticks to the port via a joystick Y-cable that can be obtained from most computer stores. Please refer to the discussions of MIDI in Chapter 8 and joysticks in Chapter 13 for further information.

Internal Connectors

Figure 2-3 shows the connectors on your sound card that are accessible only from inside your PC. The only times you will plug cables into these

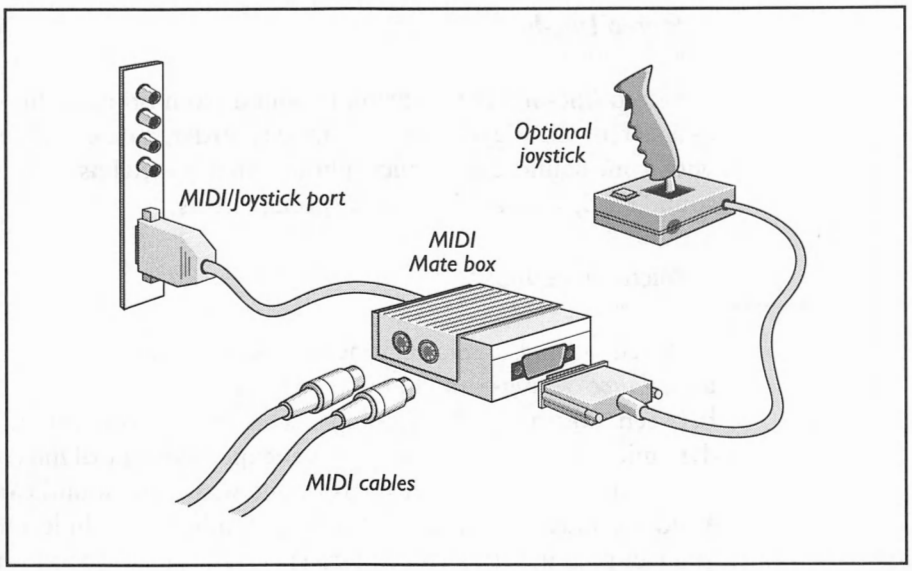


FIGURE 2-2 *A MIDI Mate with two MIDI cables and a joystick plugged in*

connectors are when you're inserting the sound card into the computer or when you've removed the computer case to make changes to your hardware.

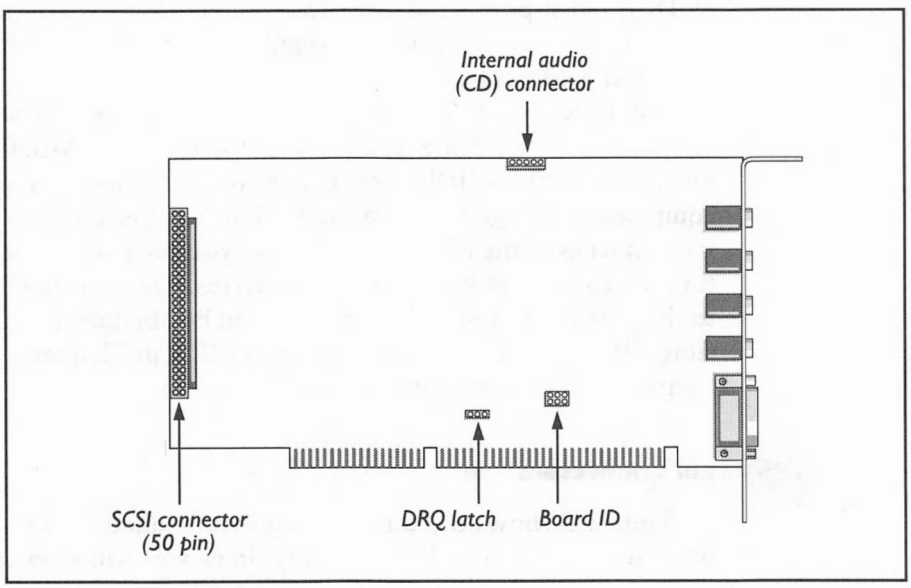


FIGURE 2-3 *Internal connectors on a typical sound card*

The SCSI Connector

This 50-pin connector at the card edge connects your sound card to a SCSI (small computer system interface) device. Its main purpose is to control a CD-ROM drive. However, since this is a standard SCSI connector, you can connect virtually any SCSI device to the Pro Audio cards, such as a SCSI hard drive, provided you have the correct SCSI software drivers. Refer to Appendix C for a clear and concise explanation of SCSI technology and some of the peripherals you can connect to the Pro Audio sound cards. See Chapter 11 for more information about CD-ROM drives.



NOTE: *Certain versions of the sound cards have a similar connector which is not SCSI-compatible. If the connector has fewer than 50 pins, then it's not a SCSI connector. Some PAS 16, Studio 16, and Pro AudioSpectrum Plus cards have a proprietary CD-ROM interface that works with only certain model CD-ROM drives. A special version of the Pro AudioSpectrum 16 with a non-SCSI connector was bundled with certain Media Vision Fusion Multimedia upgrade kits.*

The Internal Audio (CD) Connector

This connector accepts audio input from an internally or externally mounted *CD-ROM* (compact disc read-only memory) drive. Different CD players require different cables to complete this connection correctly. Check Chapter 11 for a list of CD-ROM drives and cable kits.

Other Connectors and Jumpers

There are several additional connectors and jumpers, which exist on some sound cards but not others, and which aren't important most of the time. To make this section complete, they are briefly described here.

THE INTERNAL SPEAKER You'll probably see these pins on the Pro AudioSpectrum 16 and earlier Pro AudioSpectrum only. This allowed the mixer to add PC speaker sound to the other sound sources. The most recently designed sound cards accomplish this without necessitating a wire hookup.

THE BOARD ID The Board ID jumper makes it possible to assign a unique *ID* (*identification number*) to a sound card. The idea is that you can install up to four Media Vision sound cards in a single PC, and by specifying the card ID, you tell the software programs which sound card to use. At this time, this feature is not exploited by software programs, except for a Media

Vision utility provided on the disk that accompanies this book, so it is not yet useful.

THE DRQ LATCH *DMA (direct memory address)* channels quickly transfer data within the PC. For example, your sound card uses a DMA channel to quickly dispatch digital audio data to your hard disk as you record from the microphone or another sound source. Since it's unlikely you'd tinker with your sound card while doing a tape backup, your sound card and tape backup controller are logical candidates for sharing a DMA channel. A few PCs don't allow sharing a DMA channel, even if the two devices were to do so at different times. For these PCs the Data ReQuest (DRQ) line must be latched, which means it must be reserved exclusively for the sound card's use. Changing the position of this jumper tells the sound card to latch the DMA channel. Read further in this chapter to find out more about DMA.

Sound Functions and Their Chips

The *chips* that perform the major functions of a Pro AudioSpectrum 16 sound card are shown in Figure 2-4 and are described in the following sections. The chips labeled *Spectrum* are part of Media Visions's Spectrum chip set. These chips, custom-made by Media Vision, are combined with

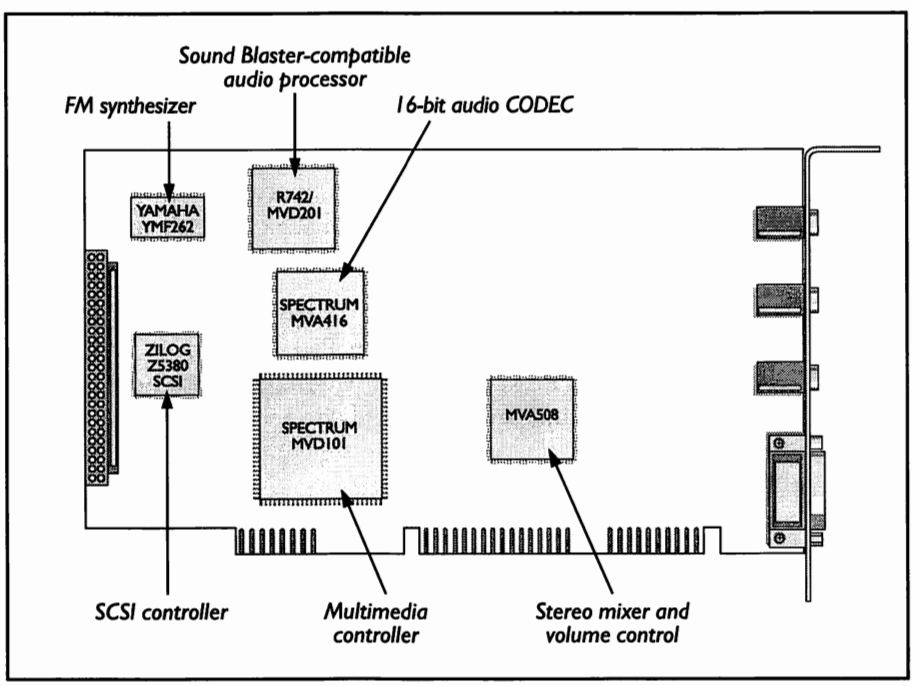


FIGURE 2-4 The chips that are the brains behind the Pro AudioSpectrum 16

industry-standard chips like the Yamaha YMF262 FM synthesizer chip to create a sound card.

Note that the part numbers shown for the chips may be different from those on your card. Components are sometimes replaced with functional equivalents, or an improved version of a chip, with a slightly different part number, may be introduced.

The earlier 8-bit Pro AudioSpectrum is similar but more crowded. Many of the functions of the original Pro AudioSpectrum were integrated together into the Spectrum custom chip set, resulting in fewer parts and a board that is more reliable and less expensive to manufacture. In addition to the components explained here are voltage regulators, a timing crystal, amplifiers, and dozens of small resistors, capacitors, and other components—all of which play an essential support role but don't merit individual description.

The Multimedia Controller

Here's the heart of your sound card. This 160-pin chip coordinates the work of all the other chips on the board but handles many tasks by itself. Among the tasks it exclusively handles are MIDI and joystick control.

Digital Audio (PCM)

The Multimedia Controller and the Spectrum MVA 416 16-bit audio CODEC (coder-decoder) handle the *digital audio* function. The digital audio part of your sound card is also known as the pulse code modulation (PCM) circuitry. The PCM circuitry converts analog sound, perhaps from the microphone, to a digital form that can be stored on your hard drive and manipulated with a wave form editor. A *wave form editor* is a software program with which you edit the digital audio as freely as you would edit a word processing document. The same PCM circuitry is then used to convert the digital audio to analog form so it can be played through the speakers.

The Pro AudioSpectrum 16, Pro AudioStudio 16, Fusion CD 16, and other sound boards and multimedia systems with the *16* in their name all share 16-bit PCM circuitry. This means that each digital audio sample can be 16 bits in resolution, the same as CD-ROM players. The earlier sound cards, the Pro AudioSpectrum, PAS Plus, and Sound Blaster-compatible Thunder Board, record and play back only 8-bit digital audio. Recordings made with 8 bits sound flat in comparison to 16-bit recordings. Recording with 16 bits provides greater dynamic range and, at the top sample rate of 44,100 sound samples per second, delivers CD-quality recording.

The digital-to-analog and analog-to-digital conversions required for digital audio playback and record are performed by the 16-bit audio CODEC chip.

This chip, labeled MVA 416, is part of the Spectrum chip set. This chip includes an *anti-aliasing filter* to block high frequency noise—which is inadvertently introduced by the analog-to-digital conversion—from getting mixed in with the desired sound. An output *smoothing filter,* which smoothes out the rough edges that result from the digital-to-analog conversion, is also built in. The Multimedia Controller has a supporting role in processing the digital audio, providing timing and control signals.

The FM Synthesizer

The 16-bit sound cards use the new Yamaha YMF262 (OPL3) FM synthesizer integrated circuit to create musical instrument sounds. This chip is capable of simultaneously creating up to 20 different 2-operator *voices* (instrument sounds). By using this integrated circuit, Media Vision has made their card compatible with game software that was written to play FM music on the earlier AdLib and Sound Blaster cards.

The MIDI Controller

The MIDI (pronounced "mih-dee") controller is found within the Spectrum MVD 101 chip that serves as the Multimedia controller. Your sound card can control a MIDI musical instrument network through its MIDI connector/joystick port. The MIDI controller is bidirectional and full-duplex. By *bidirectional* we mean that you can use a software program called a *MIDI sequencer* to both play and record MIDI music. Since the MIDI controller is also *full-duplex,* you can play and record simultaneously.

With a MIDI sequencer you can compose music and then have the computer play it for you. The controller is bidirectional, so you can also play a keyboard synthesizer yourself and have the sequencer convert the music into musical notation. Since the music is stored on disk as notes and instrument instructions, it's a piece of cake to rework your composition. You'll need to buy the optional MIDI Mate box to plug in external MIDI instruments such as a keyboard synthesizer or drum machine.

All Media Vision sound cards can be connected to a MIDI network and will work with the most popular music software. The Pro AudioStudio 16 cards, and the more recently manufactured versions of Pro AudioSpectrum 16 (beginning with Revision D that first included the Quick Start), also *emulate* (work like) the Roland MPU-401. The Roland MPU-401 hardware interface has become the standard in the music industry for an intelligent MIDI interface, and now any compatible interface is simply called an MPU-401 interface. By emulating the MPU-401, your sound card can simultaneously play and record MIDI music.



TIP: *When buying Windows software don't worry about MPU-401 compatibility. It's necessary only for some DOS MIDI software applications and an occasional game.*

The SCSI Controller

The Pro Audio SCSI controller is based on the Zilog Z5380 chip. Its primary purpose is to control a CD-ROM drive with a SCSI interface. You can also control other SCSI devices, such as a hard drive with a SCSI interface. To connect other devices, you will need to purchase *driver software*, small programs that are loaded from the CONFIG.SYS or AUTOEXEC.BAT files when your computer powers on. The driver software, often called *drivers*, enable your computer to talk to these devices. Trantor, a company that specializes in SCSI software, sells drivers that support hard drives, removable hard drives, and magneto-optical drives. The Multimedia Controller chip plays a supporting role for SCSI. See Appendix C for more information on SCSI.

The Stereo Mixer and Volume Control

The Pro Audio mixer is the chip labeled MVA 508. The *mixer* combines up to eight sound sources, including the FM synthesizer, internal CD audio, external line-in, digital audio from the PCM circuitry, microphone, and an emulation of PC speaker sound. All but the last two are stereo sources. The mixer is an exceptionally high-fidelity, low-noise mixer with a *flat*—meaning uniform—frequency response from 30Hz to 20KHz. (*Hz* is the abbreviation for *Hertz*, the unit of measurement for frequency. 1Hz signifies one *cycle* per second, which simply means one vibration each second. 1 *KHz* means 1,000 cycles per second.)

The mixer controls not only the relative volume of each source, but also the master volume delivered to the speakers or headphones. There are 64 steps in this master volume control. Many software program make the mixer controls accessible by showing on the screen a picture of a mixer control panel, complete with sliders and knobs, which you adjust with keystrokes or by mouse movements. There are independent controls for *cut*, a decrease in volume, as well as *boost*, an increase in volume, for both the *treble* (high-pitch) sounds and *bass* (low-pitch) sounds. A *loudness filter* can be switched on as well to boost the bass.

A *stereo enhancement* feature gives all sounds, monaural and stereo, a richer, more dynamic texture. This will also increase the stereo separation which is useful when the normal stereo effect is diminished, such as when the speakers are in proximity (small PC speakers placed on the desktop, for example).

The *low-pass* input and output filters, which remove noise from digital audio recordings and playback by blocking very high frequency sounds, are commonly thought of as part of the mixer, but are actually located in the 16-bit audio CODEC chip.

Sound Blaster-Compatible Audio Processor

The chip labeled MVD 201 provides the additional circuitry that enables the Pro Audio board to emulate a monaural Sound Blaster 2.0 sound card. By emulating the Sound Blaster, the Media Vision card gains compatibility with all game software designed for Creative Labs' Sound Blaster sound cards. The chip's key role is to compress and decompress digital audio. Digital audio—sound that has been converted to computer bytes that the computer understands—is used by games to provide special effects and recorded voices. These recordings are often compressed to minimize the amount of disk space required. The MVD 201, like Sound Blaster, uses the ADPCM (adaptive digital pulse code modulation) technique, described in Chapter 5, to provide compression ratios of 2:1, 3:1, and 4:1. This means that a digital audio sample can be compressed to as much as one-quarter of its original size with minimal loss of sound quality.

INTERFACING

This section is designed to squeeze a $299 one-day hardware interfacing course into a 20-minute whirlwind. If you ever get under the hood of your PC to install sound cards and the like, this section is for you. We talk about bus architecture, direct memory address (DMA) channels, interrupt request (IRQ) lines, and port addresses. A good understanding of these components will help you solve hardware conflict problems when installing your Media Vision sound card.

Bus Architecture

A computer bus is analogous to a highway. Imagine the computer's CPU (central processing unit—the brain of your PC) as a city, and all the other resources such as memory, video, printer ports, serial ports, and so on, as suburban areas all interconnected by a highway. Information "traffic"—better known as *data*—travels between these areas via this electronic highway or *bus*. The wider the highway, the more traffic it can handle. The width, or data *bandwidth,* of the bus is measured in number of bits—the higher the number of bits, the better. As we'll describe, a PC bus can be 8, 16, 32, or

64 bits wide. The other important aspect in determining the amount of traffic a highway can handle is the speed limit. In the case of the computer bus, this is measured in *megahertz* (MHz), or millions of cycles per second. The higher the speed limit the better, hence the higher the megahertz the better. These two factors, the width and speed of the computer bus, together determine the speed in which data can be moved between computer resources, and ultimately contribute to the overall speed of any PC.

Card Slots and Connectors

The Media Vision sound card is physically inserted into the computer by pushing the card into one of the *slots* in your computer's case. Each slot has a connector attached to your computer's motherboard, the main circuit board that contains the CPU (central processor unit such as the 80486). These connectors all together are sometimes called the *back plane.* The slot and connector together are designed to provide a firm mechanical and electrical home for *add-on boards,* electrical circuitry that add hardware features to your PC. Among the most popular circuit boards are sound cards, modems, network interface cards, and video display cards.

The ISA Bus

A typical PC today has the same bus as the original IBM PC-AT, and accordingly its bus is called an *AT bus* or *AT-compatible bus.* Recently, this bus has also been given the name *ISA bus* which means Industry Standard Architecture. With a couple of exceptions, all of Media Vision's sound systems are designed to fit into the ISA bus. The exceptions are Media Vision's Audio Port, a miniature sound card in its own cigarette-pack-sized box that plugs into the parallel port of any IBM-compatible computer, and Media Vision's Apple Macintosh products.

A desktop computer with an ISA bus typically sports eight slots for add-on cards. Six or seven of these slots feature a 16-bit connector on the motherboard, and are referred to as *ISA slots* or *16-bit slots.* One slot has a noticeably shorter connector whose sole purpose is to provide a home for the older 8-bit cards that were used in the original PC and PC-XT. Some ISA PCs also have an extra long, proprietary (specific to that manufacturer) 32-bit connector. This connector, if it exists, is provided for memory expansion after the memory banks on your computer's motherboard are filled. Cards that fit into the 16-bit slots are referred to as PC-AT or AT-compatible cards or ISA cards. An example of a motherboard with six standard 16-bit ISA slots, an 8-bit slot, and a proprietary 32-bit slot is shown in Figure 2-5.

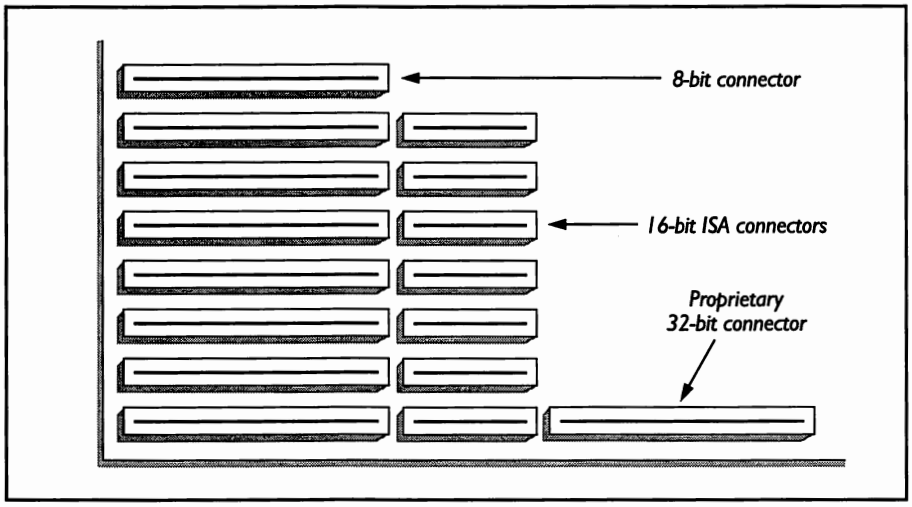


FIGURE 2-5
A typical PC motherboard with six 16-bit ISA slots, one 8-bit slot, and a proprietary 32-bit slot

The MCA Bus

When IBM introduced the PS/2 line it offered a new 32-bit design called *Micro Channel Architecture* (MCA). The MCA bus accommodates additional PC cards with much less configuration effort and also delivers superior performance to that of an ISA bus. Due to its proprietary nature and expensive licensing requirements, the design didn't catch on, and IBM is virtually the sole manufacturer of MCA bus computers. The current IBM PS/2 line features computers with either the MCA, the traditional ISA bus or a local bus. Media Vision does not manufacture sound cards for the MCA bus. You can, however, attach the Audio Port to the external parallel port of any IBM-compatible personal computer, MCA or ISA.

The EISA Bus

A third bus design called Extended Industry Standard Architecture (EISA), pronounced "ice-sah," is found on many Intel 80386- and 80486-based PCs and network file servers. The EISA bus features a 32-bit bus that can move data around twice as fast as the ISA 16-bit bus. This bus design was designed by Compaq and other leading PC manufacturers to combat the MCA bus. It was introduced a little after MCA, and has become mildly popular for PC users who require the extra performance afforded by the EISA bus. The biggest advantage of the EISA over the MCA bus is that, unlike the MCA bus, EISA is completely backwards-compatible with the ISA standard. Backwards-compatible simply means that any ISA card can be plugged into an EISA slot. All Media Vision sound cards can therefore be used in any

EISA computer. At this time, neither Media Vision nor any other major manufacturers offer an EISA-specific sound card.

Local Bus

All of the bus designs mentioned so far are eclipsed in performance by the *local bus,* a bus design that moves data to add-on cards at high speed. A consortium of leading vendors called Video Electronics Standards Association (VESA) devised a 32-bit bus designed for speeds of up to 40MHz. This standard is known by several designations, including VESA Local Bus and VL-Bus. The high speeds afforded by local bus design are mainly beneficial to video controllers—although the benefits may extend to other peripherals in the near future. Intel has also designed a local bus implementation known as *Peripheral Component Interconnect* (PCI) that can be up to 64 bits wide.

Since the applications for such a high speed bus are currently both expensive and limited, only one or two local bus slots can be found in a typical PC (see Figure 2-6). The VESA slots are ISA-compatible, so if you're out of regular ISA slots, you can plug your Media Vision ISA sound card into a VESA local bus slot.

Laptop Bus Architecture

Laptop computers often have one or two small, proprietary slots that are unique to that manufacturer, which are designed to accommodate a modem

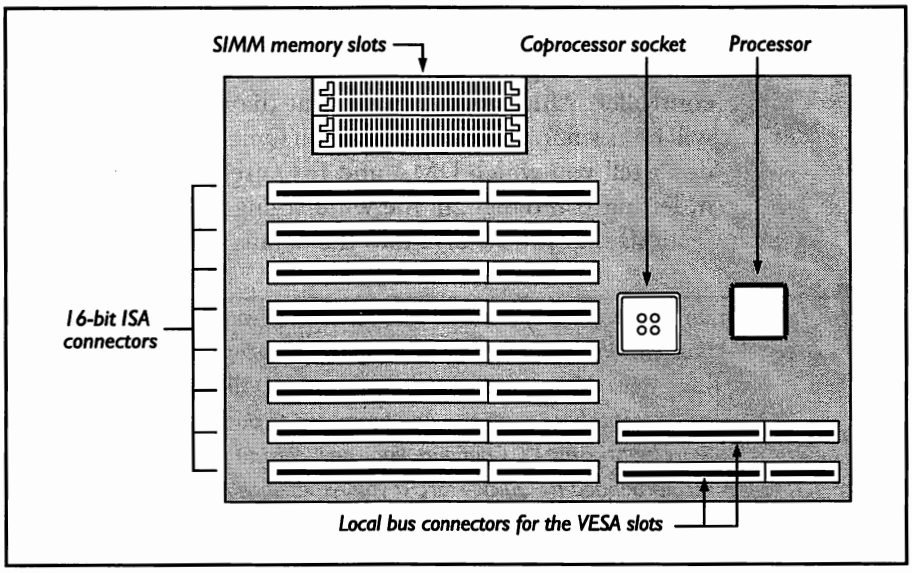


FIGURE 2-6 A typical PC motherboard with six 16-bit ISA slots and two 32-bit VESA local bus (VL) slots

or memory expansion card. Occasionally they have a single ISA slot. The newest of the laptop and notebook computers feature one or two externally accessible PCMCIA (Personal Computer Memory Card International Association—a real mouthful) connectors. The PCMCIA cards that fit into these connectors resemble fat credit cards. You can easily insert and remove PCMCIA cards, without tools, while you almost need to be a technician to access the internal slots of a laptop computer. It is already clear that PCMCIA is the wave of the future. It's also spreading to desktop computers so you can easily share peripherals, like a modem, between your laptop and desktop computer. PCMCIA modem, network, and even sound cards are already available. As this book goes to press, Media Vision doesn't yet manufacture a PCMCIA sound card.



TIP: *All Media Vision PC sound cards work in either an ISA, EISA, or Local Bus computer. Only the Audio Port works on any IBM PS/2 with the MCA bus. Check your computer's manual to see what bus architecture your computer uses before purchasing and installing any add-on cards.*

Running Quick Start

The Media Vision Quick Start program, provided for the newer 16-bit sound cards, does an excellent job of identifying DMA channels and interrupt request lines already in use, and then configuring the card to select previously unused ones. With these cards you don't have to set DMA or IRQ jumpers manually. DMA and IRQ are set through software, by the installation program. Unfortunately, although your sound card installation may go smoothly, you can still get into trouble when you install yet another device into your computer, perhaps a scanner, network card, or tape backup unit controller. Although it's likely that the install program for your next card will be as smart as the Media Vision Quick Start, many installation programs don't tell you which DMA and IRQ are already taken, or do a poor job at it, letting you dangle in the wind trying to decide which one to select. The sections that follow dive into the details of DMA and IRQ.



TIP: *If you successfully installed your sound card with the Quick Start, and you're now having problems installing another card, try the following. First, rerun the hardware install for your Media Vision card, writing down which DMA and IRQ it identified as available. Do* **not** *accept these settings when prompted to do so by Quick Start. Instead, exit Quick Start by pressing F3. Configure your new card to the DMA and IRQ settings recommended by Quick Start. If you experience any difficulty after following this procedure, contact the manufacturer of the card you are trying to install.*

Understanding DMA

The common IBM-compatible personal computer has eight *direct memory address* (DMA) channels. These channels are used for the high speed movement of data within your computer without burdening the CPU of your computer. For example, one DMA channel is reserved for use by your hard disk in moving data directly between the hard disk and the RAM memory where programs are loaded and executed. Another DMA channel is taken over by the disk controller for use by the floppy disk drives. DMA transfers allow smart peripherals, like your sound card, to move data into and out of main memory without intervention from the CPU. This frees up the CPU for more important tasks.

Your sound card requires a DMA channel for digital audio processing. The *pulse code modulation* (PCM) circuitry on your sound card converts *analog* (continuous) signals, such as those from a microphone or CD stereo output, into a *digital* (discrete numeric) form called *digital audio* (refer to Chapter 4 for a discussion on this topic). Digital audio can then be stored on the hard disk and easily edited. Converting CD stereo analog sound to digital form takes a lot of computer bytes, as many as 176,400 bytes per second, which works out to over 10.4MB (megabytes) per minute. To move that much data quickly enough to keep up with the stereo source without completely jamming up the CPU, your sound card must use a DMA channel.

Selecting DMA Channels

Most computers allow two cards to share a DMA channel, but this isn't ideal. It's a lot like sharing a toy with a sibling; most of the time everything works out fine, but when there is a conflict, everything blows sky high. Just imagine the mayhem caused by a hard disk drive controller that thinks another device, say an optical scanner or tape drive controller, is sending information to the hard drive when it's not. Moreover, DMA sharing is not a universal feature—many PCs will not allow two or more cards to share a DMA channel.

Media Vision's latest sound cards, including the Pro AudioSpectrum 16 and the Pro AudioStudio 16, provide seven different DMA channel choices among the eight available in the more advanced PC motherboards. Motherboards are the main circuit board of your computer where your CPU—probably an 80286, 80386, 80486, or Pentium—and SIMM or RAM memory chips reside. Channel 4, which is reserved for the computer's use, cannot be selected. When installing an add-on card, select DMA channel 5, 6, or 7 if they're available. Channels 5 through 7 are high-speed 16-bit channels, while channels 0 through 3 are 8-bit channels that move data only half as quickly.



NOTE: *The Pro AudioSpectrum Plus, Pro Audio 16, Pro AudioStudio 16, and Thunder Board provide complete Sound Blaster emulation. The Sound Blaster-compatible circuitry in these cards requires a DMA channel (usually DMA 1) that's different from the one used by the Pro Audio native circuitry specific to the Pro Audio family. Ultimately, you must have two unused DMA channels for hassle-free use of the Pro Audio sound cards.*

Media Vision's Pro AudioSpectrum and Thunder & Lightning, two of the earlier sound cards, provide a choice among three DMA channels only. The Thunder Board, like the original Sound Blaster it competes against, has the DMA fixed at channel 1. Even if you aren't a power user, it's easy to run out of DMA channels when your peripheral cards can be set to only the lower DMA channels.



TIP: *If you're in the market to buy a PC, make certain that the motherboard supports the extended set of DMA channels (4-7) and IRQ request lines (8-15). Just because the motherboard has an 80386 or 80386SX chip on it, don't assume that it has these extended settings. Without the breathing space provided by these extended settings it can be very difficult to add more than one additional peripheral such as a network card, scanner, or sound card to your PC, and it will be impossible to add more than two additional peripherals that require their own DMA channel.*

Tables 2-1 and 2-2 show typical DMA assignments. The *default* (recommended) settings are designated by the asterisks in the DMA channel column.



NOTE: *If you are having difficulty recording or playing back a 16-bit sound file, try using a 16-bit DMA, which is in the 5-7 range.*

If you're installing a sound card or another peripheral device, consider these two additional points:

- Virtually all programs designed for the Sound Blaster will deliver digital audio sound effects and voices only if the Sound Blaster portion of the Pro Audio cards is set to DMA 1.
- You should avoid sharing a DMA channel whenever possible.

DMA Channel	Status
0	Available
1*	Available
2	Floppy disk
3*	Available
4	Not available (memory refresh)
5**	Available
6**	Available
7**	Available

*Recommended for DOS applications; DMA 1 is the required setting for Sound Blaster emulation.

**Default setting for Windows (Pro Audio native mode).

TABLE 2-1 *DMA Channel Choices for the Pro AudioSpectrum 16 and Other 16-bit Cards* ■



TIP: *When you're running Microsoft Windows 3.1, Media Vision software can automatically reconfigure the sound card to use a different DMA for Windows than you do for DOS. This automatic, behind-the-scenes switching makes it possible to use DMA 1 for Sound Blaster compatibility when running DOS games and a more suitable DMA when running Windows programs.*

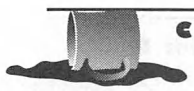
DMA Channel	Status
0	Available
1*	Available
2	Floppy disk
3	Available

*Default setting

TABLE 2-2 *DMA Channel Choices for the Thunder Board, Thunder & Lightning, and Pro AudioSpectrum* ■

There are occasional exceptions to these DMA settings. When trying to sort out which device in your computer uses which DMA channel, be aware that any of the following may require a DMA channel:

- Network card (usually DMA 1)
- SCSI or other storage device controller
- Tape backup controller
- Proprietary printer controller (such as a hardware PostScript controller)
- Scanner card
- SDLC (Synchronous Data Link Controller)



CAUTION: *If you're forced to share a DMA channel, make certain to pick two devices that are unlikely to ever run at the same time. For example, your sound card and a tape backup controller should be able to coexist on the same DMA channel, since it's unlikely you'll use both at the same time. Never share a DMA channel used by a SCSI hard disk controller.*

DMA Conflicts

Solving DMA conflicts is a necessary evil when dealing with a PC that's loaded with add-on cards. Fortunately, this process is made friendlier with the Pro Audio sound cards from Media Vision. You can change the DMA settings by rerunning the Quick Start program. In Microsoft Windows you can set the DMA through the Control Panel. (See Chapter 3 for details.) Many other cards demand the patience of a saint to reconfigure. You have to go through the tedious process of taking off the computer case, flipping DIP switches and moving jumpers around, slipping the case back on, turning on the computer, and so forth.



NOTE: *If you can't play or record digital audio, chances are you have a DMA conflict. Rerun Quick Start and select another DMA channel, or refer to Chapter 3, which discusses how to manually change the settings in the CONFIG.SYS and SYSTEM.INI files.*

Interrupt Requests or IRQs

When a device, such as your sound card, needs your computer's attention, it sends a signal on an Interrupt ReQuest (IRQ) line. An interrupt request is similar to students raising their hands to get the teacher's attention. A peripheral can *interrupt* the CPU to request the CPU's help. A controller chip intercepts these interrupts and determines their relative priority. The peripheral with the highest priority gets the CPU's attention until its needs are satisfied or until there is a more urgent interrupt.



NOTE: *Occasionally, if a PC is overburdened by other programs that are demanding too much from the CPU, your audio or music program may not get serviced quickly enough, and music playback will exhibit popping, hissing, or otherwise distorted sound. This may be the time to consider upgrading to a faster computer.*

Peripheral devices can share an IRQ line, but you must be very careful. For example, most PCs will allow you to share an IRQ between the parallel printer port and the sound card without conflict. In general, not sharing an IRQ is preferable. The wrong device may respond to the IRQ, causing that device to behave strangely or not work at all.

In an ideal world, programmers would write software drivers—which handle interrupts for software programs—to handle an interrupt and pass it on to any other program that may be checking for the same level interrupt request (same IRQ number). Unfortunately, software drivers are often written as if each one is king of the hill, so that when a driver sees an interrupt, it won't pass it on to other programs that may be chained to the same interrupt. This can lead to some very challenging troubleshooting when a program running under DOS sometimes works correctly (when its driver is loaded first) and sometimes fails to work (when the other driver has been loaded ***before*** your program's). This particular tricky problem doesn't occur as often in Windows because Windows assigns a priority to drivers that is independent of the order in which they are loaded.

The line that includes MVSOUND.SYS in your CONFIG.SYS file tells the sound card what IRQ (and DMA) to use when running a DOS program.

Table 2-3 shows the available IRQ settings for the Pro Audio 16-bit cards. The default (recommended) settings are designated by the asterisks in the IRQ column.



NOTE: *Avoid IRQ 2 when possible. This IRQ is used by certain video cards for EGA compatibility. It is also an IRQ commonly used by network cards and bus mouse.*

It's best to select a low-order (2-7) IRQ for the Sound Blaster portion of your Pro Audio card. If all the low-order ones are taken already, to change one of your other cards to use a high-order IRQ (10-15). The reason for this is that many Sound Blaster-compatible computer games are compatible with only the low-order IRQs.

Finally, when using IRQ 3 or 4, be careful of a conflict with a modem or mouse assigned to COM1 or COM2. Some modems have a COM3 and COM4 assignment. COM1 and COM3 share the same interrupt request line, as do COM2 and COM4.

If you're installing a sound card or another peripheral device, and you're not absolutely certain what IRQs have already been selected, watch out for these additional considerations:

- Some Sound Blaster-compatible programs will only work if the Sound Blaster portion of the Pro Audio card is set to IRQ 5 or 7.
- You should avoid sharing an IRQ when possible.



TIP: *When running Microsoft Windows 3.1, if MVSOUND.SYS isn't loaded, you can use a different IRQ for Windows than you do for DOS.*

The original Pro AudioSpectrum and Thunderboard offer the IRQ choices shown in Table 2-4.

Port Addresses

The CPU in your PC controls and communicates with many other devices through the use of *input* and *output* (I/O) ports. These *ports* are like gateways, or doorways through which information passes as it travels from any I/O device such as a printer or sound card. All I/O devices therefore have a *port address* through which the CPU can send information. Port addresses consist of ranges of addresses instead of a fixed number like a DMA channel or an IRQ number.

IRQ	Status
2***	Available
3	COM2 2nd serial port & COM4 4th serial port
4	COM1 1st serial port & COM3 3rd serial port
5*	Available
6	Floppy disk controller
7**	Available LPT1 (PRN) 1st parallel printer port, but usually shareable
8	Not available
9	Not available
10	Available
11	Available
12	Available
13	Not available (80287 coprocessor)
14	Not available (hard disk controller)
15	Available

*The usual setting for Sound Blaster compatibility (relevant to the Thunder Board and 16-bit sound cards running in Sound Blaster compatibility mode under DOS). Most DOS software games expect the sound card to be set for IRQ 7.

**The usual setting for a Pro AudioSpectrum 16 or Pro AudioStudio 16 running in Pro Audio native mode in either DOS or Windows.

***The required setting for MPU-401 emulation by the MIDI controller. This applies to both the Pro AudioStudio 16 and the Pro AudioSpectrum 16.

TABLE 2-3 *IRQ Choices for the Pro AudioSpectrum 16 and Other 16-bit Cards* ■

IRQ	Status
3	COM2 2nd serial port & COM4 4th serial port
4	COM1 1st serial port & COM3 3rd serial port
5**	Available
6	Floppy disk controller
7*	Available LPT1 (PRN) 1st parallel printer port but usually shareable

*The usual setting for a Pro AudioSpectrum.

**The usual setting for Sound Blaster compatibility (relevant to the Thunder Board). Most DOS software games expect the sound card to be set for IRQ 7.

TABLE 2-4 *IRQ Choices for the Thunder Board and the Original Pro AudioSpectrum* ■

The *base address* is generally the lowest address used by the card. Table 2-5 shows the port addresses used by some common peripherals, ports, and controllers. The asterisks indicate devices built into the sound card.



NOTE: *The port addresses are represented in hexidecimal, the base-16 numbering system, where values 0 through 9 are followed by values A through F. The digit A is equivalent to 10 in the decimal, base-10 numbering system, while F is equivalent to 15.*

For instance, when a software program such as the Falcon flight simulator wants to communicate with your sound card, it can "talk" to the sound card through these port addresses. Suppose the flight simulator program needs the FM synthesizer to create a special buzzing sound. Knowing the port address of the sound card, the program knows where it will find the FM synthesizer. The software program can then write to these addresses and directly program the synthesizer (which is itself a little computer). Similarly, a software program can

Description	I/O Port Address Range (in Hexadecimal)
Math coprocessor	0F8-0FF
Joystick/Game port*	200-207
Primary parallel printer (LPT1)	378-37F
Secondary parallel printer (LPT2)	278-27F
Primary serial port (COM1)	3F8-3FF
Secondary serial port (COM2)	2F8-2FF
Hard disk controller	1F0-1F8
Floppy disk controller	3F0-3F7
VGA card	3B0-3DF
Digital Audio (Sound Blaster)*	220-22F
Roland MPU-401 MIDI controller**	330-33F
FM synthesizer (AdLib/Sound Blaster/ Pro Audio left channel)*	388-389
FM synthesizer (Pro Audio right channel)**	38A-38B

*Built into all Media Vision sound cards.

**Found in the latest 16-bit sound cards only.

TABLE 2-5 *Commonly Used I/O Port Addresses* ■

check the status of the sound card by reading the register contents at a memory address within the range owned by the sound card.

Peripheral card memory addresses are, for all practical purposes, staked out on a first come, first served basis. For example, the AdLib card and Sound Blaster were designed with the address registers for controlling the FM synthesizer starting at 388H.

The Sound Blaster's Digital Audio address is at 220H. In order to emulate the AdLib card for the purpose of creating FM-synthesized music, it can also be addressed at the 388H base address for the AdLib and Sound Blaster cards. Media Vision uses the same technique for their cards.



TIP: *If you want your 16-bit Pro Audio card to be compatible with all the programs written to play music and sound effects on the AdLib or Sound Blaster's FM synthesizer, you should select 220H as the base address for the Sound Blaster-compatible port. Some programs do provide a means of configuring the base address; others—especially many games—are not so flexible. For some reason, many naive or lazy programmers assume that the user will never change the default settings for their sound cards.*

All Media Vision Pro Audio cards have a MIDI port. Among the refinements of the Pro AudioStudio 16 and newer Pro AudioSpectrum 16 is emulation of the Roland MPU-401 interface for attaching a MIDI network. The MPU-401 MIDI controller is a device in its own right and requires its own port address. Media Vision uses the standard MPU-401 address of 330H as its default for the MIDI port. The joystick port, if it is enabled during the Quick Start, will respond to port address 200H.

Unlike DMAs and IRQs, port addresses cannot be shared. Cards can usually be configured for a variety of port addresses. However, you should avoid deviating from the standard 220H and 330H addresses for your Pro Audio card. Most devices are used by only one program; a tape backup is probably just used by a backup/restore program provided by the manufacturer. If you change the port address for the tape backup card, it is relatively easy to reconfigure the one program that uses it. The situation is much different for your sound card. If you deviate from the standard address for your sound card, you may have to reconfigure dozens of software programs that use the sound card. If you must reconfigure a card's port address due to a conflict, change your sound card's address as the very last resort.

Upper Memory

The *upper memory* area is the part of the computer's address space between 640K and 1024K, above the 640K where DOS application programs are loaded. The upper memory area is where the *ROM BIOS*, which

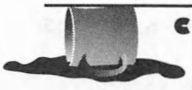
has very basic instructions for running the computer, is found. This area of memory, also called the *ROM/UMB memory address* or *high memory*, is also used by display adapters, for the display memory, as well as some other devices. Your Media Vision sound card does not use upper memory, so you needn't worry about potential conflicts with other devices that use high memory or memory managers.

Ideal Settings

In summary, the ideal and hassle-free settings for the Pro Audio cards for maximum compatibility are:

- Pro Audio section set at DMA 5, IRQ 7
- Sound Blaster emulation set at port address 220H, DMA 1, IRQ 7
- MPU-401 MIDI emulation set at port address 330H-33FH, IRQ 2

These settings work great for both DOS and Windows. By default, the Quick Start program will attempt to select these values whenever possible. Note that MPU-401 MIDI emulation is turned off, and that the joystick port is turned on by default. If you already have another joystick port, make sure to disable the joystick port on your Pro Audio card during the Quick Start.



CAUTION: *Sometimes, while Quick Start is testing a combination of settings, your computer will stall. If this happens, it is likely that you have a hardware conflict, or your computer is incapable of and/or incompatible with the tested settings; you may have to reset your computer by turning it off and manually installing the software. Refer to Chapter 3 for information on properly installing the DOS and Windows drivers and software for your Pro Audio sound card.*

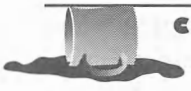
INSTALLATION

Installing anything in your computer can turn out to be a frustrating and destructive experience. Arming yourself with the right tools, information, and instructions can greatly reduce the likelihood of this unpleasantness. A Media Vision sound card may be the first card you install on your computer. Fortunately, the Media Vision installation manuals are clearly illustrated. Read through the installation manual completely before actually attempting the physical install itself. Here are a few tips to help you along the way.

Tools and Procedures

The first thing you'll want to do is to make sure you've got the right tools. Although your computer may be slightly different than others, all PCs share many common elements. A #2 Phillips screwdriver and/or a 1/4-inch nutrunner (nut driver) is required to remove the screws that hold the computer cover and slot covers. On most Compaq computers, you'll need a Torx wrench to remove the screws. Tweezers are helpful for when you inadvertently drop the screws onto the motherboard, between two add-on cards.

Before you grasp the sound card or perform surgery on the computer, make sure that you *ground* yourself to discharge any static electricity that has accumulated on your body (see also the caution that follows). Computer chips don't react well to static electricity—you can easily ruin your day by shocking yourself and destroying a sound board at the same time. Keep the sound card in its protective anti-static bag till you're ready to plug it into the slot.



CAUTION: *Contrary to popular advice, you should leave your computer plugged into the wall whenever possible. This grounds the computer while you're working on it. Ground yourself, to remove built-up static electricity, by touching the metal case of the power supply before handling any circuit boards or chips. Be sure that the computer is turned off before opening it up. (Imagine what a deadly situation it would be for a surgeon and the patient, if the latter was not under anesthesia when the surgeon worked inside the body!)*

It's very important to make correct connections. Take note of the orientation of all cables before disconnecting or attaching them. An inverted connection can destroy a circuit card or damage the computer itself. When using flat-ribbon cables, the colored stripe (usually red) on one side denotes pin 1. As far as connectors are concerned, pin 1 is usually marked with a small triangle or the number 1. Be careful not to bend any pins when inserting a connector—align the pins with the holes before applying pressure on the connector. Double check to ensure that all connections are tight. When you replace the cover, be careful not to dislodge a connector by accidentally catching the cable when you slide the cover back on.

Ensure that all cards are correctly seated in their connector. On occasion, it takes a lot of force to completely seat a card. Usually you can visually inspect a card to see whether it is seated correctly or sitting askew in its connector. Check that the gold fingers all protrude the same distance from the top of the connector.

It is also important that you replace the screw that holds the card down. It's very easy to unseat a loose card when plugging cables, such as the joystick cable, into the external connectors. If you turn the computer on with a card loose in its slot, you'll probably blow up at least your pocketbook.

You may want to leave the cover unscrewed until you're sure you've solved all hardware conflicts. Turn on the power and make sure everything is working before tightening the cover with multiple screws. Finding out that you have to change a jumper setting on the card after you have put on the cover is a very trying experience—especially if it occurs more than once.

Recording Your Hardware Setup

Figures 2-7 and 2-8 illustrate a simple recordkeeping system that will make life with your computer much more pleasant. There is a simple way to avoid headaches and wasted hours trying to install new add-on cards. All you need to do is make an accurate record of the hardware settings already in use and update it as you make changes to your computer. Figure 2-7 is a useful label for that purpose. Make a photocopy of it, cut it out, and attach it to the computer case with tape. Write with a pencil so you can easily revise the label to reflect changes to your computer system. This label should make your life much easier the next time you need to look up a setting when configuring software, or any time you need to resolve a device conflict. Figure 2-8 shows an example of a completed label.

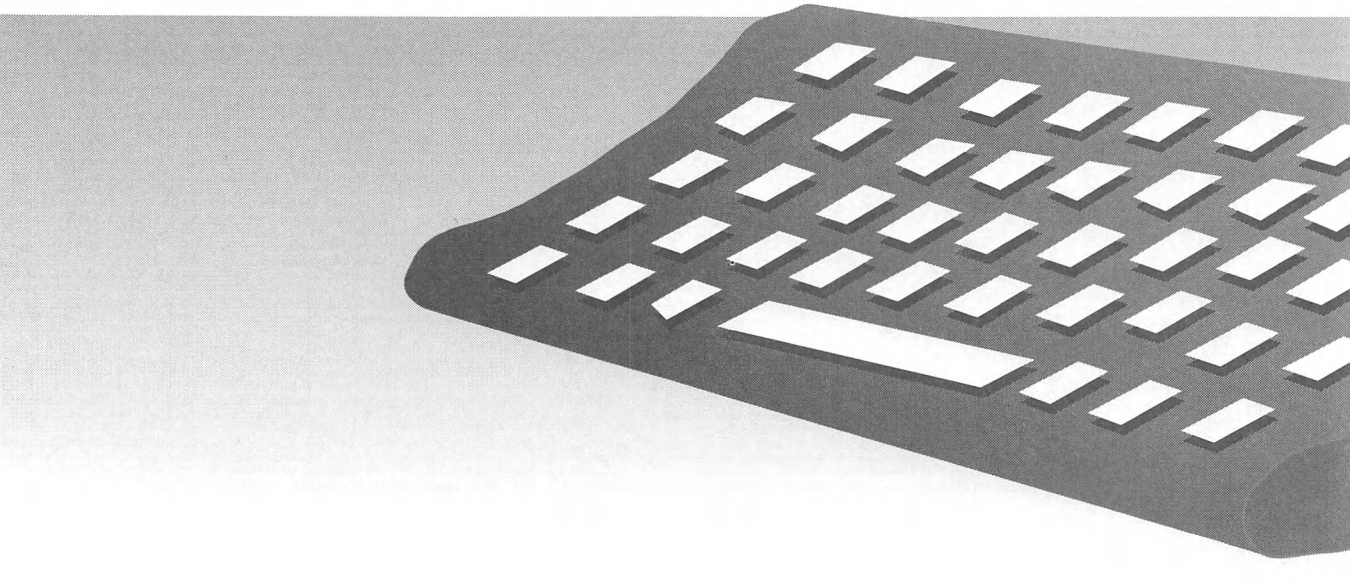
FIGURE 2-7 A blank hardware configuration label

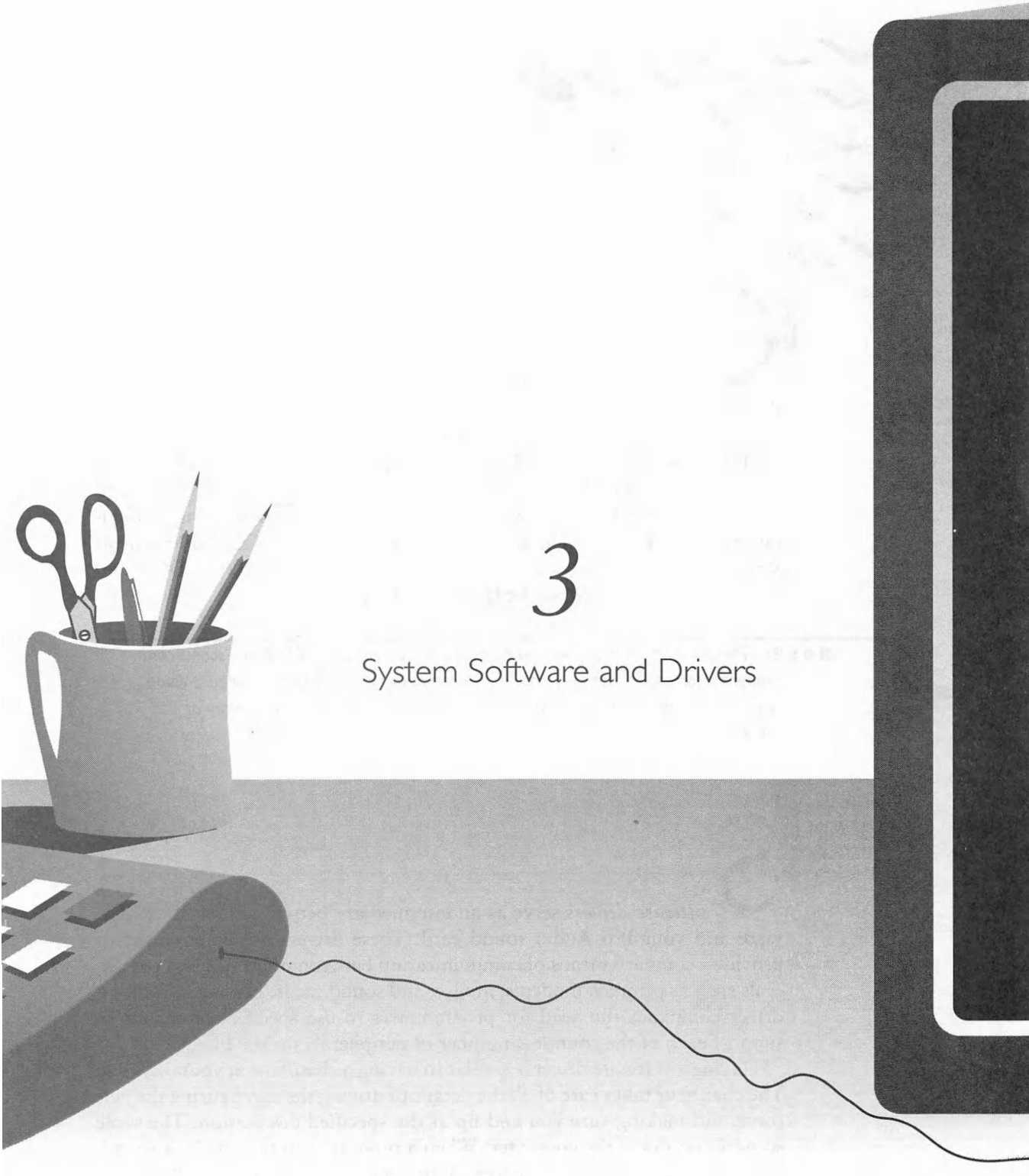
Device/Card	DMA	IRQ	Port Address	ROM/UMB Address
Hard Disk	Type	Heads	Cylinders	Sectors

FIGURE 2-8

A completed hardware configuration label

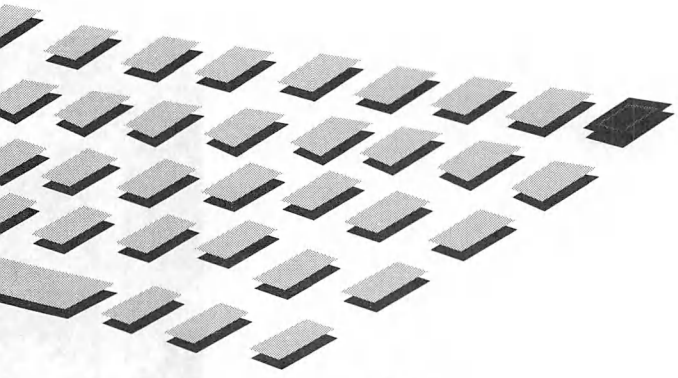
Device/Card	DMA	IRQ	Port Address	ROM/UMB Address
LPT1		7	378-37F	
COM1, COM2		4,3	3F8-3FF 2F8-2FF	
Super VGA				A000-C7FF
Network Card		2	300-31F	
Tape Backup	7	11	340-34F	
Pro Audio Studio 16	SB1,5	SB5,7	220-23F	
MIDI MPU-401		2	330-33F	
Joystick			200-207	
SCSI Card	6	12		C800-C9FF
Hard Disk	Type	Heads	Cylinders	Sectors
Maxtor IDE213A	41	16	683	38



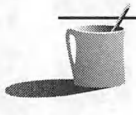


3

System Software and Drivers



CHAPTER 2 provided some hints on physically installing your Pro Audio sound card and avoiding hardware conflicts. This chapter offers you some insight into the software that helps make the Pro Audio sound card work. First, we will explain what software drivers are and why they're required. Next, we'll take a look at the automatic installation program and describe its functions. Then we'll dive straight into what a working configuration looks like for different operating environments (DOS and Microsoft Windows 3.1). Along the way, we talk about the different DOS and Windows mixers and describe their operation to you.



NOTE: *The installation guide provided by Media Vision with every Pro Audio sound card contains information that may not be included in this chapter. Use the Media Vision installation guide as your primary reference and this chapter as a secondary or supplementary reference.*

WHAT ARE SOFTWARE DRIVERS?

Software drivers serve as an intermediary between application software and your Pro Audio sound card. These drivers are widely used to provide a standard means of communication between programs and peripherals such as printers, modems, mouse, and sound cards. Having a standard driver eliminates the need for programmers to use specific commands to support each of the countless number of peripherals for the PC.

Having a software driver is similar to having a chauffeur at your disposal. The chauffeur takes care of all the details of driving the car, figuring the best route and making sure you end up at the specified destination. The same scenario occurs in the computer. When a program wants to make a sound, it simply tells the software driver to, for example, play a song. The driver

worries about the details of translating the notes into instructions for the Pro Audio sound card, sending the information to it and making sure the sound plays correctly.

An example where drivers are used extensively is in Windows 3.1. You'll find that Windows uses a video driver to control your video adapter and monitor, a mouse driver for your mouse, and a printer driver, among many others. DOS also uses a variety of drivers to communicate with peripherals including CD-ROM drives. SMARTDRV.EXE, HIMEM.SYS, EMM386.EXE, and MSCDEX.EXE are all examples of DOS drivers that perform numerous specialized functions.

Most DOS software drivers are TSR (Terminate Stay Resident) programs. TSR drivers are usually loaded from the DOS configuration files when you first *boot* (or start) your computer. So, software drivers are loaded in either the CONFIG.SYS or AUTOEXEC.BAT files. As the name implies, TSR drivers remain in memory as long as your computer is turned on, translating software commands and interfacing with the hardware. Microsoft Windows requires its own special drivers in addition to the DOS drivers. The Windows drivers are loaded when you first start Windows and are automatically unloaded when you exit.

The Pro Audio sound cards require drivers for both DOS and Windows for proper operation in those environments. The drivers provide a standard interface for software applications to use your Pro Audio sound card to make sounds and music. The automatic installation program that comes with your Pro Audio sound card attempts to install the drivers for you.

Two other operating systems—OS/2 and Microsoft Windows NT—also provide drivers for the Pro Audio sound card. The OS/2 driver is still being tested as this book goes to print, but it should be available from Media Vision by the time you read this. Windows NT drivers, on the other hand, are included with the Windows NT package.

THE AUTOMATIC INSTALLATION PROGRAM

The automatic installation software, which Media Vision calls *Quick Start,* usually does a good job of installing all the appropriate drivers. However, there are an almost endless number of computer configurations to contend with, and sometimes the Quick Start program doesn't work correctly. If Quick Start causes your computer to freeze, you'll probably have to configure the software manually.

Quick Start begins by copying all the appropriate software from the distribution floppy disks to your hard drive. The software drivers (and other programs) are originally stored in a compressed format on the floppy disks. During the installation process, these files are decompressed into a usable form and stored on your hard disk. The directory to which all the software is copied depends on the Media Vision sound card or multimedia upgrade kit. For example, software is copied to C:\PASTUDIO for the Pro AudioStudio 16, C:\DOUBLECD for the Fusion DoubleCD 16 multimedia upgrade kit, and C:\PROAUDIO for the Pro AudioSpectrum 16. Do take note of where Quick Start puts all the files—you'll need to find them later. It is probably best to let Quick Start copy the software into the suggested, or *default,* directory. Except for the occasional bad floppy disk, this part of the installation process is relatively trouble-free.

If you encounter a bad floppy disk and DOS has a problem reading the disk, it displays a message similar to this:

```
General failure reading drive A
Abort, Retry, Fail?
```

Sometimes, you can press R (for retry) several times and Quick Start continues successfully. If you've tried R at least half a dozen times and the message keeps reappearing, chances are that the damage to the disk is too big to overcome. Sometimes removing the disk and reinserting it into the drive before pressing R helps clear the problem. If you're lucky, and you've pressed R a couple of times and the Quick Start program continues, you may proceed with the rest of the installation. Otherwise, press A to abort the install. In either case, you may want to return the disk to Media Vision for replacement.

After decompressing and copying all the files into a directory on your hard drive, the next thing that the install program attempts to do is to determine the proper setup for the Pro Audio sound card. It tests your computer to find an unused interrupt (IRQ) and DMA channel and recommends them for use by the Pro Audio sound card. This step is where possible *lock-ups* (when the computer no longer responds to any keyboard input) occur.



NOTE: *A lock-up can occur during the IRQ or DMA testing phase of the installation for a variety of reasons. It is important, when a lock-up does occur, that you understand the software drivers well enough to be able to configure them manually, which should solve your problem.*

If the IRQ and DMA testing phase completes successfully, then Quick Start has made the appropriate changes in your computer's startup files to

load the Pro Audio drivers when you next boot your computer. If you elect to install the Windows drivers, changes are also made to the Windows startup files after the testing phase. Quick Start prompts you to reboot your computer when it completes all the installation procedures successfully.



NOTE: *To manually adjust the different software settings for your Pro Audio sound card, you need to be familiar with a DOS text editor. One such editor that is easy to learn and use is EDIT, included with DOS 5 and DOS 6. Refer to the DOS manual for instructions on how to use this text editor.*

DOS DRIVERS

The descriptions provided in the following sections are mainly for information and troubleshooting purposes. The Quick Start program provided with your Pro Audio sound card should take care of most of the installation process and card settings for the DOS drivers described below. If you have to perform a manual installation, the following sections should also prove useful.

MVSOUND.SYS

The main DOS driver for the Pro AudioSpectrum 16 and the Pro AudioStudio 16 is MVSOUND.SYS. MVSOUND.SYS *initializes,* or "wakes up," your Pro Audio sound card and sets the IRQ and DMA that the card uses. The driver allows access to the mixer built into the Pro Audio sound card. It also provides the ability to adjust volume levels from the keyboard in almost any DOS program using the following hot key combinations:

CTRL-ALT-U	Increase volume
CTRL-ALT-D	Decrease volume
CTRL-ALT-M	Toggle mute on/off

The hot key combinations may not be supported or may be disabled in certain DOS programs. Since there is no way to physically alter the volume level on the Pro Audio sound card, you may want to set the volume before starting any of these DOS programs. You can do this at the DOS prompt by using the hot key combinations or the DOS mixer program (covered later in this chapter).

If you are not going to run any DOS applications that use the Pro Audio sound card, you can avoid loading the MVSOUND.SYS driver altogether. If you do omit the driver, none of your DOS programs will be able to generate

sounds. (Since Windows loads its own drivers, you still get sound in Windows without the DOS driver.) Omit the driver only if you desperately need to free up the 11KB of memory taken up by MVSOUND.SYS for other DOS applications.



TIP: *If you're also installing a CD-ROM drive with the Pro Audio sound card, refer to Chapter 11 for specific drivers that need to be loaded in both CONFIG.SYS and AUTOEXEC.BAT.*

MVSOUND.SYS is required to enable your Pro Audio sound card to work correctly with most DOS programs. Without this driver, most DOS programs do not even realize that you have a Pro Audio sound card installed in your computer. It is very important to always have the latest version of MVSOUND.SYS to ensure that new software works with your Pro Audio sound card. You can obtain the latest version of this software by calling Media Vision or downloading it with your modem from a variety of online services, such as the Media Vision BBS or CompuServe. (Refer to Appendix D for more details on these services.)



TIP: *Many games provide their own special sound drivers for the Pro Audio sound cards. If a game doesn't have such a driver, or if you're having problems with the game's Pro Audio sound driver, you can always choose to use the Sound Blaster or AdLib driver.*

Loading MVSOUND.SYS in CONFIG.SYS

MVSOUND.SYS is the first Pro Audio DOS driver that should be loaded in CONFIG.SYS. This driver enables and sets up the Pro Audio sound board so that DOS applications can use it. A line like the following must be in the CONFIG.SYS file for your sound card to work correctly. (The code has been broken into two lines here due to publishing constrictions. Be sure to enter it as a single line in CONFIG.SYS.)

```
DEVICE=[path]\MVSOUND.SYS D:n Q:n J:1|0 [V:n]
S:1|0,Port,DMA,IRQ M:1|0,Port,IRQ [T:1]
```



NOTE: *On older versions of MVSOUND.SYS, a slash was required before any parameter (e.g. /D:3). The slash was done away with from version 3.19 on. The latest version of MVSOUND.SYS at the time of printing is version 3.23.*

The parameters control different aspects of the Pro Audio sound card and are broken out into the following groups.

General Setup Parameters

[*path*]	Specifies the path where MVSOUND.SYS resides on your hard disk. Example: C:\PASTUDIO.
D:*n*	This parameter specifies the DMA channel to use for the Pro Audio mode. Valid numbers for *n* are 0, 1, 3, 5, 6, or 7. Use of 16-bit DMA channels 5, 6, or 7 is recommended for the best performance. Example: D:5.
Q:*n*	This parameter specifies the interrupt (IRQ) to be used by the Pro Audio mode. Valid numbers for *n* are 2, 3, 4, 5, 7, 10, 11, 12, and 15. Sharing an IRQ with a printer port or serial port is fine as long as you don't intend to use the Pro Audio sound card and printer, mouse, or modem at the same time. Example: Q:7.
J:1|0	This parameter is used to enable or disable the joystick port on the Pro Audio sound card. J:1 enables the joystick port, and J:0 disables the joystick port. Refer to Chapter 13 for more information on joysticks.
V:*n*	The V parameter specifies the initial master volume setting for the Pro Audio sound card upon startup. The *n* can be a round number from 1 to 100. Example: V:50. If this parameter is omitted, the Pro Audio volume is set to 80 on startup.

The next two parameters, Sound Blaster emulation settings and MPU-401 MIDI port emulation, only work with the newer Revision D Pro AudioSpectrum 16, Pro AudioStudio 16, and the Pro AudioStudio 16XL. The earlier Revision C Pro AudioSpectrum 16 SB emulation is set via jumpers and is not software configurable. Refer to the User's Guide for the appropriate jumper settings if you have a Revision C card. Revision A and Revision B Pro AudioSpectrum 16 were never released or sold by Media Vision. (For the curious, the revision—C or D—actually refers to the revision of the 101 chip used in the Pro AudioSpectrum 16 boards.)

Sound Blaster Emulation Parameters

S:1|0	1|0 indicates whether SB (Sound Blaster) emulation is on (1) or off (0).
Port	*Port* is the port address number for SB emulation. Valid numbers are 220, 230, or 240. Use 220 whenever possible—most software does not work with another setting because this is the original SB default.
DMA	*DMA* is the DMA channel for SB emulation. It must always be set to 1, as it is fixed on this setting with the original SB.
IRQ	*IRQ* is the interrupt for SB emulation. Valid numbers are 2, 3, 5, or 7. The default is 5. Avoid using 2 if at all possible, as this may conflict with some PCs. Cannot be the same as the Q:*n* setting.

The Roland MPU-401 standard dominated the MIDI interface scene for quite a while. Most programs that access the MIDI port have been modified to work with the one on the Pro Audio sound card using MIDI Mate. Consequently, MPU-401 emulation is not as valuable or useful as it used to

be, since almost all MIDI programs work with the Pro Audio MIDI port directly. So for all practical purposes, you should disable this emulation unless you specifically have a program that works only with an MPU-401 MIDI port.

MPU-401 MIDI Emulation Parameters

M:1|0	1|0 indicates whether to enable (1) or disable (0) MPU-401 MIDI port emulation.
Port	*Port* is the port address for MPU-401 emulation. Valid numbers are 300 and 330. Use 330 if possible.
IRQ	*IRQ* is the interrupt used for MPU-401 emulation. The default is 2.

Some computers have non-standard motherboards that cause the Pro Audio sound cards to emit a lot of hiss, static, crackling, and other strange sounds when playing music. If you encounter this problem, try the following timer parameter.

Timer Parameter

T:1	Enables the use of the timer on the Pro Audio sound card to eliminate static noise with certain computers.

For the technically inclined, timer incompatibility has to do with an out-of-spec oscillator found on many OPTI chipset-based motherboards that conflicts with the Yamaha OPL-3 FM synthesizer chip. Fortunately, the Media Vision engineers had the foresight to include an alternative timer on the Pro Audio sound card itself. The T:1 parameter forces the Pro Audio to rely on this timer rather than the one on the motherboard.

There are other parameters for MVSOUND.SYS that are not documented anywhere else, not even in the manuals. These parameters are seldom used, but are included here for completeness.

Other Undocumented Parameters

B:*Port*	This parameter specifies the port address for the Pro Audio card to be configured. This parameter is included to allow separate configurations for each Pro Audio sound card if you have more than one in your computer. The default is 388.
G:1|0	This parameter increases gain for the Line In and Audio CD inputs. Incorrect use of this parameter leads to distorted CD sound when turned on. The default is "off".
U	Unloads driver after configuration. If you do this, most DOS programs will not work properly if they use the Pro Audio sound card.
W:1|0	Allows warm boot on (1) or off (0). The default is "on". Set it to "off" if you encounter incompatibilities with motherboards that use Phoenix, Award, or Quadtel BIOS.
X	Displays the current Pro Audio configuration. Lists some details regarding the version of your Pro Audio sound card.

Settings in the AUTOEXEC.BAT File

Once the Pro Audio card is initialized in the CONFIG.SYS file, little has to be done in the AUTOEXEC.BAT. By adding to the DOS PATH the directory in which the Pro Audio sound card software is found, you can execute any of those programs regardless of which drive or directory you're currently in. This is done for you if the Quick Start has executed successfully. Otherwise, add the Pro Audio directory name to the path. For example, let's say the software is installed in C:\PASTUDIO and your PATH statement reads as follows:

```
PATH=C:\;C:\WINDOWS;C:\BAT;C:\UTIL
```

To include the directory where the board drivers and software reside, change it to the following:

```
PATH=C:\;C:\WINDOWS;C:\BAT;C:\UTIL;C:\PASTUDIO
```

If you have enabled SB emulation on your Pro Audio sound card, you also need a statement like the following in your AUTOEXEC.BAT:

SET BLASTER=A*n* D1 In T3

The elements of this statement are explained here:

A*n*	The *n* is the same as the *Port* setting in your S: parameter when loading MVSOUND.SYS. It specifies the base port address for SB emulation. Example: A220.
D1	The D parameter specifies the DMA for SB emulation. It must be identical to the *DMA* setting in the S: parameter when loading MVSOUND.SYS. This is always D1.
I*n*	Specifies the interrupt for SB emulation. The *n* must match the *IRQ* setting in the S: parameter when loading MVSOUND.SYS. Example: I5.
T3	T3 specifies that the Pro Audio sound card is emulating a Sound Blaster version 2.0 card. Do not change this.



NOTE: *If you have a Version C Pro AudioSpectrum 16, the settings for SET BLASTER should reflect the jumper settings you used for SB emulation.*

To give you an example of how to set the SET BLASTER parameters correctly, if your CONFIG.SYS contains the following statement,

```
DEVICE=C:\PASTUDIO\MVSOUND.SYS D:3 Q:7 J:1 S:1,220,1,5 M:0
```

then the corresponding entry for AUTOEXEC.BAT is the following:

```
SET BLASTER=A220 D1 I5 T3
```



NOTE: *The above-mentioned lines of code are the only lines that are added automatically by Quick Start.*

An executable program called PROAS.EXE can be included in the AUTOEXEC.BAT file but provides essentially identical services to MVSOUND.SYS. However, while MVSOUND.SYS has defaults for all settings, PROAS.EXE does not. PROAS.EXE is used mainly to reconfigure the Pro Audio sound card on the fly without having to reboot the computer for troubleshooting purposes.

PROAS.EXE is not a TSR and therefore does not take up any memory. The parameters are exactly the same as those for MVSOUND.SYS with the omission of the U parameter (which is redundant in this case) and one addition:

R	Resets the Pro Audio sound card. This is used to return the Pro Audio sound card to its startup state.

You can obtain an onscreen listing of all the PROAS.EXE parameters by entering **PROAS /?** on the DOS prompt line.

The DOS Mixer (PAS.EXE)

The DOS mixer allows you to control the volumes of the different inputs, the FM chip, and the DACs (digital-to-analog conversions) that are found on the Pro Audio sound card. It also allows you to adjust the treble, bass, and other settings. The DOS mixer program is called PAS.EXE, and it is found in the directory where all the Pro Audio software resides. Figure 3-1 shows how the inputs on the Pro Audio sound card correspond to the mixer level settings.

PAS.EXE has two modes of operation—command line and interactive.

Command Line Mode

Command line mode allows you to write batch files to set a variety of options. Each command must be typed on a single line. The format of a command is as follows:

PAS *COMMAND* {*REQUIRED PARAMETERS*} [*OPTIONAL PARAMETERS*]

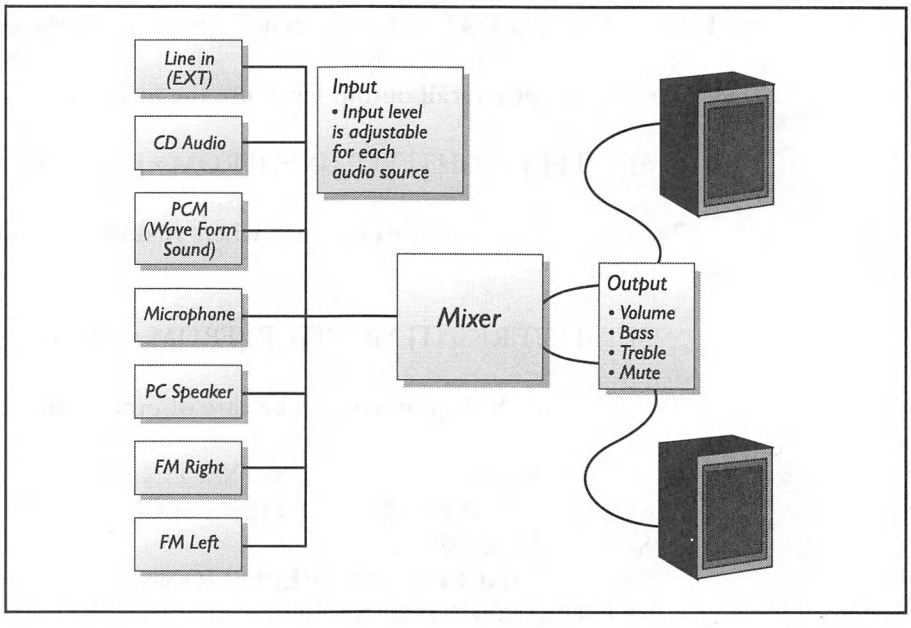


FIGURE 3-1 *The DOS mixer controls various Pro Audio inputs and outputs*

COMMAND can be either SET, GET, HOLD, RELEASE, or RESET. The SET commands and parameters are as follows.

SET [LEFT|RIGHT] FM [FROM *n*] TO *n* [IN *n* SECONDS]
SET [LEFT|RIGHT] EXT [FROM *n*] TO *n* [IN *n* SECONDS]
SET [LEFT|RIGHT] INT [FROM *n*] TO *n* [IN *n* SECONDS]
SET [LEFT|RIGHT] MIC [FROM *n*] TO *n* [IN *n* SECONDS]
SET [LEFT|RIGHT] SPEAKER [FROM *n*] TO *n* [IN *n* SECONDS]
SET [LEFT|RIGHT] SB [FROM *n*] TO *n* [IN *n* SECONDS]
SET [LEFT|RIGHT] PCM [FROM *n*] TO *n* [IN *n* SECONDS]

The device codes that appear in the commands above have the following meanings:

FM	The Pro Audio FM Synthesizer output
EXT	The external line-in jack
INT	The internal audio CD jack
MIC	The microphone input level
SPEAKER	The PC speaker level
SB	The SB emulation 8-bit DAC
PCM	The Pro Audio 16-bit DAC

If both the keywords LEFT and RIGHT are omitted, the command affects both channels simultaneously.

To control the overall output level, use the following command:

SET [LEFT|RIGHT] VOLUME [FROM *n*] TO *n* [IN *n* SECONDS]

To control the monitoring level when making a recording, use this command:

SET [LEFT|RIGHT] MONITOR [FROM *n*] TO *n* [IN *n* SECONDS]

The following SET commands take care of other sound levels:

SET BASS [FROM *n*] TO *n* [IN *n* SECONDS]
SET TREBLE [FROM *n*] TO *n* [IN *n* SECONDS]
SET MUTE {ON|OFF}
SET ENHANCED {BASS|TREBLE} {ON|OFF}
SET REALSOUND {ON|OFF}

And finally, a couple of seldom-used SET commands include CROSSCHANNEL for swapping channels (so that left becomes right and right becomes left):

SET CROSSCHANNEL {LEFT|RIGHT} TO {LEFT|RIGHT}
{ON|OFF}

and STUDIO, which works only with the Pro AudioStudio 16 and 16XL:

SET STUDIO [MONITOR|LINEBOOST|INTBOOST|ABSWITCH]
{ON|OFF}

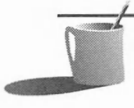
GET commands are used to determine the level at which an input is set or the state of a switch. The GET commands and parameters are:

GET [LEFT|RIGHT] FM
GET [LEFT|RIGHT] PCM
GET [LEFT|RIGHT] INT
GET [LEFT|RIGHT] EXT
GET [LEFT|RIGHT] SPEAKER
GET [LEFT|RIGHT] MIC
GET BASS
GET TREBLE

GET [LEFT|RIGHT] VOLUME
GET MUTE
GET ENHANCED
GET REALSOUND
GET CROSSCHANNEL
GET STUDIO

The rest of the line mode commands and parameters are listed here:

HOLD holds all SET commands (up to 16) in a queue until a RELEASE statement.
RELEASE executes all SET commands put in the queue since the last HOLD statement.
RESET resets the Pro Audio card to its defaults.



NOTE: *In the following sections, the examples require that e directory where PAS.EXE resides be included in the PATH statement in your AUTOEXEC.BAT file.*

If all those options look daunting, don't worry—they're actually pretty easy to understand and very flexible once you look at some examples. The following demonstrates several correct ways to SET a mixer level.

```
PAS SET VOLUME TO 90
PAS SET TREBLE TO 60
PAS SET FM FROM 0 TO 50
PAS SET PCM FROM 0 TO 40 IN 3 SECONDS
PAS SET RIGHT EXT FROM 0 TO 50 IN 3 SECONDS
PAS SET LEFT EXT IN 3 SECONDS TO 0 FROM 50
```

The following commands might be used to determine the volume, button, or mixer levels:

```
PAS GET VOLUME
PAS GET FM
PAS GET MUTE
PAS GET CROSSCHANNEL
PAS GET ENHANCED BASS
```

The GET command returns the level at which a mixer is set or the condition of a button. The following are some examples:

```
PAS GET VOLUME
```

This command returns the current volume level, as shown here:

```
The volume is set at 35%
```

The following command returns a condition:

```
PAS GET MUTE
```

The result of the command is shown here:

```
Mute is turned OFF
```

The HOLD and RELEASE feature is useful when you're issuing a number of commands that you want to go into effect simultaneously. For example, this command series

```
PAS HOLD
PAS SET MIC FROM 50 TO 0 IN 2 SECONDS
PAS SET VOLUME TO 100 IN 2 SECONDS
PAS RELEASE
```

would cause the Pro Audio sound card to HOLD all following commands until the RELEASE command. This would cause the microphone to cut off at the same time that the master volume was set to full, in two seconds.

The following listing illustrates commands for turning on the bass enhancement, turning off the treble enhancement, turning off mute, and resetting the Pro Audio sound card.

```
PAS SET ENHANCED BASS ON
PAS SET ENHANCED TREBLE OFF
PAS SET MUTE OFF
PAS RESET
```

The PAS.EXE program is fairly forgiving and allows you to use the first three characters of the keywords instead of typing the words completely. Here is an example with keywords spelled out completely:

```
PAS HOLD
PAS SET VOLUME TO 90
PAS SET BASS TO 70
PAS SET ENHANCED TREBLE ON
PAS SET RIGHT EXT FROM 0 TO 50 IN 3 SECONDS
PAS RELEASE
```

Here is an example that works identically as the preceding listing, even though the keywords are abbreviated:

```
PAS HOL
PAS SET VOL TO 90
PAS SET BAS TO 70
PAS SET ENH TRE ON
PAS SET RIG EXT FRO 0 TO 50 IN 3 SEC
PAS REL
```

It is helpful to have a DOS batch file setup for your preferred selections. For instance, the following shows a batch file that sets up the Pro Audio sound card when the computer is first turned on:

```
@echo off
cls
echo Setting Pro AudioStudio 16 levels...
C:\PASTUDIO\PAS HOLD
C:\PASTUDIO\PAS RESET
C:\PASTUDIO\PAS SET VOLUME TO 75
C:\PASTUDIO\PAS SET FM TO 95
C:\PASTUDIO\PAS SET EXT TO 75
C:\PASTUDIO\PAS SET INT TO 0
C:\PASTUDIO\PAS SET MIC TO 0
C:\PASTUDIO\PAS SET SPEAKER TO 0
C:\PASTUDIO\PAS SET SB TO 90
C:\PASTUDIO\PAS SET PCM TO 85
C:\PASTUDIO\PAS SET BASS TO 50
C:\PASTUDIO\PAS SET TREBLE TO 50
C:\PASTUDIO\PAS TURN ENHANCED BASS ON
C:\PASTUDIO\PAS TURN ENHANCED TREBLE ON
C:\PASTUDIO\PAS RELEASE
echo ...All done!
```

You can use the above as a template and copy it to different BAT files that set up the Pro Audio sound card for different programs. With multiple preset mixer settings, you can easily execute the appropriate BAT file to set up your Pro Audio sound card before starting the different programs.



TIP: *To reduce hiss, turn off all the sources that you are not using by reducing their levels to zero in the mixer. For instance, if you're not using the Line-In connector, turn it off with "PAS SET EXT TO 0."*

Interactive Mode

PAS.EXE also has an interactive mode (see Figure 3-2) that allows you to adjust levels and settings interactively with the keyboard. You can execute the mixer in this mode by typing the following at the DOS prompt:

```
PAS *
```

This mode is handy when you're trying to find the optimum levels for your setup or configuration—the adjustments to the different levels are reflected immediately in the sound output. The Utilities Guide (or User's Guide, depending on which Pro Audio sound card you have) contains basic information on operating the DOS mixer in interactive mode. The F1 key brings up a handy list of keys you can use in the program.

One of the hidden features of the interactive mode is the DOS mixer's ability to store and recall up to four settings. After setting the levels to your satisfaction, press SHIFT and F5, F6, F7, or F8 to store the settings in one of the four slots. The settings are kept in files named SETTING0.PAS through SETTING3.PAS in the directory where PAS.EXE resides. You can adjust the levels to suit up to four applications and then save it to the four different settings files. To retrieve the settings, start the DOS mixer in interactive mode and simply hit any one of the four function keys (do not press SHIFT).

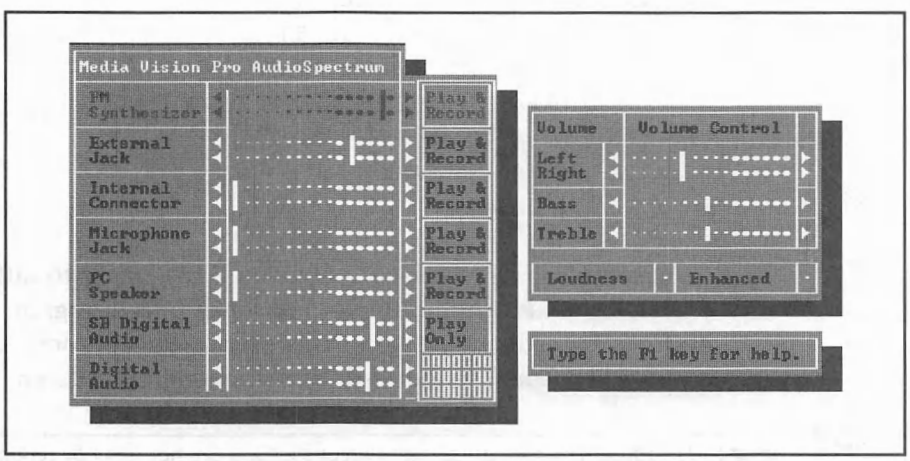


FIGURE 3-2 *The DOS mixer in interactive mode*

WINDOWS DRIVERS

Using your Pro Audio sound card in Microsoft Windows 3.1 requires loading drivers that are specific to the Windows environment. During installation, certain files are copied to your Windows directory and changes are made to two Windows 3.1 configuration files, SYSTEM.INI and WIN.INI. The Quick Start program can automatically do this for you. However, you may still want to check with the following sections for further details and hints about getting your Pro Audio sound card to work in Windows.

The following is a listing of files that should be in the directory where Windows 3.1 resides, or in your Media Vision home directory. In most cases, the home directory is C:\WINDOWS.

```
PMIX.EXE
PREC.EXE
PROMIX.EXE
```

These files are copied and placed in your Windows directory by Quick Start. If you're performing a manual install, copy these files into your Windows directory for easy access.



NOTE: *Depending on the version of Quick Start that you are using, the three files mentioned above may be left in the Pro Audio sound card's directory (for example, C:\PASTUDIO). This works fine as long as you remember to change to the appropriate directory (C:\PASTUDIO) before starting these programs in Windows.*

Likewise, the following files should be in your Windows system directory, which usually is C:\WINDOWS\SYSTEM.

```
MCIMIXER.DRV
MIDIMAP.CFG
MMMIXER.DLL
MVFM.DRV
MVMIXER.DRV
MVPROAUD.DRV
OPL3.DRV
SBWAVE.DRV
VPASD.386
OEMSETUP.INF
```

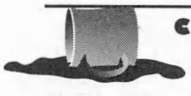
If you're running into any problems in Windows with your Pro Audio sound card, check to see that the preceding two lists of files are in the appropriate directories.



NOTE: *Version 1.0 of the Pro Audio Studio installation disk had a problem with Norton Desktop for Windows, manifested as a General Protection Fault error message. The solution to this problem is to make sure that a Windows mixer program (either Pro Mixer or Pocket Mixer) is running when you exit Windows.*

Running DOS Programs in Windows

Media Vision's driver for Windows allows your Windows and DOS software applications to share the Pro Audio sound card without the conflicts that may cause one or more of the applications to terminate. In general, this enables you to load and run Windows and then use the DOS window to run DOS-based games, applications, and/or multimedia titles you have loaded on your system.



CAUTION: *Not all games and/or applications can be run in a DOS window within Windows. If you experience difficulty with one or more applications in this regard, you should exit Windows before running the program.*

Generally speaking, running Windows in enhanced mode allows you to have a DOS application active (in a DOS window) at the same time with one or more Windows applications. If the active DOS application is using the Pro Audio sound card, it must share it with any Windows applications that also want to use it. However, since only one software application is able to use the audio hardware at a time, Media Vision's driver for the Pro Audio sound card will block access to the hardware until the first application is finished using it. For example, if you first launched a DOS-based game from Windows, and it started using the Pro Audio for playing sounds, then the sound from your alarm clock in Windows would not be heard until after the sounds from your DOS game finished playback. However, if your DOS game was not playing any sounds at the time the Windows alarm clock went off, the audio from your alarm clock could be heard.

Settings in the SYSTEM.INI File

The SYSTEM.INI file for Windows is similar to the CONFIG.SYS file in DOS. SYSTEM.INI is the file where Windows looks to determine which drivers should be loaded in memory when it first starts up. The list of drivers include those for your video card, printer, mouse, and sound card.

SYSTEM.INI contains sections divided by section headers. The section headers are enclosed in square brackets. For example, you should find all of the following sections in your SYSTEM.INI file.

```
[boot]
[keyboard]
[boot.description]
[386Enh]
[standard]
```

The Quick Start installation program makes some additions and changes to various sections of your SYSTEM.INI file. If you are installing the drivers manually, make sure that the appropriate files listed earlier in this chapter are in the correct directories. Then follow these instructions to make the necessary changes to SYSTEM.INI.

1. Edit SYSTEM.INI with a DOS text editor or the Windows Notepad program. In the [386Enh] section, place a semicolon (;) in front of the following lines, if they exist.

```
;device=vsbd.386
;device=vadlib.386
;device=vsbpro.386
```

2. Add the following to the [386Enh] section.

```
device=vpasd.386
DMABufferSize=064
```

3. In the [MCI] section, add the following.

```
mixer=mcimixer.drv
```

4. In the [DRIVERS] group, add the following.

```
wave=mvproaud.drv
wave1=sbwave.drv
aux=mvproaud.drv
midi=opl3.drv  (that is OPL3, not OP13)
midi1=mvproaud.drv
mixer=mvmixer.drv
```

5. Add the following new groups.

```
[Multimedia.Setup]
audio=mvproaud.drv,0,0,0

[mvproaud.drv]
dma=5
irq=7

[sbwave.drv]
port=220
int=5
dma=1

[opl3.drv]
drumchannel=10
```

Below are some important rules to remember when making additions to the SYSTEM.INI file.

- The Windows IRQ setting in the [mvproaud.drv] section should match that of the Q: parameter in the MVSOUND.SYS line in CONFIG.SYS. For example, if the Q parameter reads Q:7, the irq= setting in the [mvproaud.drv] section should read irq=7.
- The settings in the [sbwave.drv] section should be identical to the S: parameter in the MVSOUND.SYS line in CONFIG.SYS. For example, if the S: parameter reads S:1,220,1,5, the settings in the [sbwave.drv] section should read port=220, dma=1, and int=5 correspondingly.

If you're having problems with your Windows setup when using the Pro Audio sound card, check to make sure that all the above sections in SYSTEM.INI contain the appropriate entries. If some or all of them are

missing, follow the above instructions and make the necessary changes in your SYSTEM.INI file.



TIP: *Once the drivers are installed successfully, you can change these settings from within Windows by using the Control Panel, shown in Figure 3-3.*

Settings in the WIN.INI File

The changes made in the other Windows initialization file, WIN.INI, are minimal. The necessary lines in this file are automatically added when the drivers are loaded correctly in the SYSTEM.INI or when you run the various Pro Audio mixer programs—you should not have to change any of these settings manually.

If you are installing the drivers manually, you may want to make sure that the following are added to the WIN.INI file.

```
[Extensions]
wav=prec.exe ^.wav

[embedding]
PocketRec=Pocket Recorder Wave,Pocket Recorder Wave,
C:\WINDOWS\PREC.EXE,picture
PocketMix=Pocket Mixer Settings,Pocket Mixer Settings,
C:\WINDOWS\PMIX.EXE,picture
```

The omission of the preceding statements in your WIN.INI file is not catastrophic. However, some advanced Windows features like OLE (Object Linking and Embedding) do not work without these entries.

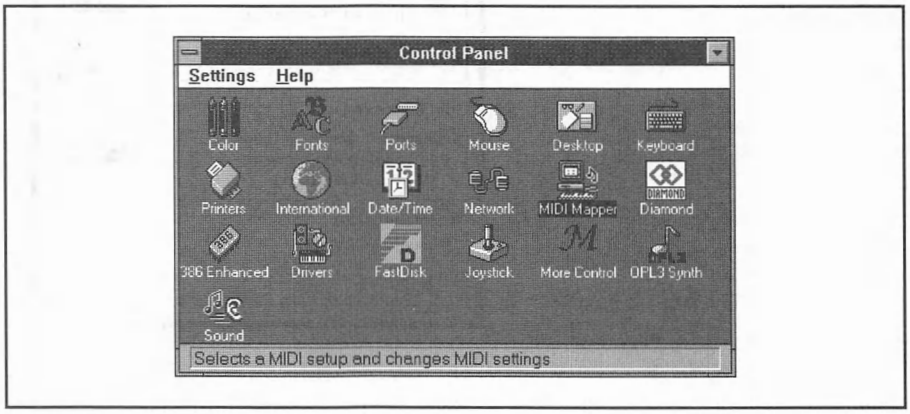


FIGURE 3-3 *The Microsoft Windows Control Panel*

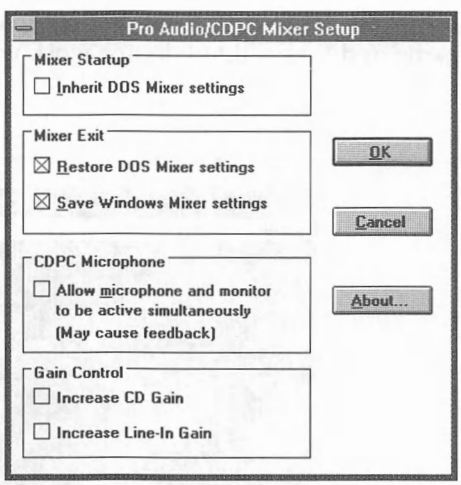
Settings in the Control Panel

The Control Panel in Windows allows you to make various changes to the startup configuration for Windows and also allows you to adjust various settings for software drivers. When you click on the Control Panel icon, you find a variety of *applets* (small programs that change various settings) that you can execute. Depending on your system, you may have fewer or more applets. However, some of the applets are similar in all systems. The two we are concerned with for the Pro Audio sound card—Drivers and MIDI Mapper—are common applets that appear on every Windows Control Panel.

When you click the Drivers applet, a properly configured system should have the following drivers in the Installed Drivers list.

```
Media Vision Pro Audio/CDPC Mixer
Media Vision Pro Audio/CDPC SndBlaster Wave
Media Vision Pro Audio/CDPC Wave/MIDI/Aux
MIDI Mapper
Voyetra OPL-3 FM Synth
[MCI] Media Vision Mixer Control
```

If any of these are missing, double-check your SYSTEM.INI file as described earlier in the section, "Settings in the SYSTEM.INI File." Follow the steps in that section to make sure all the appropriate drivers are loaded. To set up the drivers correctly, select Media Vision Pro Audio/CDPC Mixer, and click the Setup button. A window with several options is displayed, as shown here:



Controlling Volume and Mode

The analog audio mixer on the Pro AudioSpectrum is controlled by the Windows device driver program MVMIXER.DRV. This program is the equivalent in Windows to the DOS device driver MVSOUND.SYS, and it provides control of both volume and play/record modes for each audio channel, as well as overall equalization settings. MVMIXER.DRV allows you to save certain driver configuration settings to a Media Vision-specific file, MV.INI, in the Windows home directory. The options offered are explained in the following sections.

INHERIT DOS MIXER SETTINGS Selecting this option directs the Windows audio mixer driver to use the mixer settings that were being used in DOS at the time Windows was started. For example, if you set the record level for the microphone at 100 percent in DOS using the PAS.EXE program, the same record level is retained by the Windows mixer driver when Windows starts.

RESTORE DOS MIXER SETTINGS If this exit option is selected, when you exit from Windows the Windows mixer driver restores the audio mixer settings that were being used by DOS applications when Windows started. For example, if the record level for the microphone is set at 100 percent in DOS using the PAS.EXE program, and it is changed to 50 percent while being used in Windows, the Windows mixer driver returns the record level for the microphone to 100 percent when you exit from Windows.

SAVE WINDOWS MIXER SETTINGS If this option is checked, then upon exit the audio mixer settings used in Windows are saved so they can be restored the next time Windows starts. For example, if you set the record level for the microphone at 100 percent and exit Windows, the same record level is adjusted to 100 percent the next time you start Windows. However, if the user has also selected Inherit DOS Mixer Settings for startup, the DOS settings override this option.

ALLOW MICROPHONE AND MONITOR TO BE ACTIVE SIMULTANEOUSLY If this option is selected, both the microphone level and the monitor level on the CDPC and the CDPC XL can be raised (active) simultaneously. Ordinarily, the default condition of the Windows mixer driver is set to the opposite of this state, to prevent feedback from the CDPC's built-in speakers through the microphone on the front panel of the CDPC. If you choose to allow both audio channels to be active, be careful not to raise the record level for the microphone too high, as the feedback can be very loud. To avoid this, you should gradually elevate the level settings until you obtain the proper balance

without causing undue feedback. This setting only works with the CDPC/CDPC XL systems.

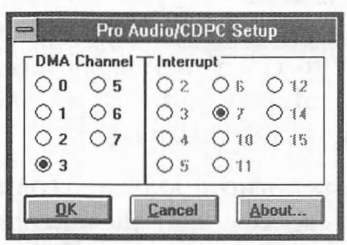
INCREASE CD GAIN OR INCREASE LINE-IN GAIN The two gain control options allow you to selectively boost the amplitude of the audio signal received from either or both Line-In and CD Digital Audio (the audio from a CD-ROM drive). This is especially useful if you are trying to record from an audio source that is not amplified and produces a weak signal. Check the device you want to record from. If the device has a control mechanism such as a volume control knob that allows you to raise or lower the volume, then the signal coming from the device is amplified. If it doesn't, then the signal is probably not amplified. Enabling the gain raises the audio signal level from the specified audio source—thus increasing the signal to noise ratio—so that you can record more sound and less background noise. This may help you create clean, crisp, noise-free recordings.



TIP: *All CD-ROM drives supplied with Media Vision multimedia upgrade kits produce enough volume to eliminate the use of the gain feature. Using the gain feature with CD-ROM drives may distort the output. If you are hearing distorted sounds from your CD-ROM drive when playing a regular music CD, be sure to turn the gain off.*

Setting the DMA and IRQ

The usual way to set the DMA and IRQ for your Pro Audio sound card in Windows is to select Media Vision Pro Audio/CDPC Wave/MIDI/Aux in the Drivers applet and click the Setup button. You are presented with the following options:



The DMA setting does not have to be the same as the one used in DOS; you can select a different DMA for Windows. However, Media Vision recommends that this setting match your DOS setting. Generally, a 16-bit DMA channel (5, 6, or 7) is preferable, but 16-bit DMA channels may not work on some computers, causing distorted sounds or computer lock-ups. Sometimes using a 16-bit DMA channel that is incompatible with your PC

may cause a memory parity error when trying to play a sound in Windows. This error is confusing, because you may not actually have a memory error but merely a conflict with the 16-bit DMA channel. Try a 16-bit DMA first. If this causes a problem, select an 8-bit DMA (0, 1, or 3).

The IRQ setting has to be identical to the Q: parameter specified in the MVSOUND.SYS line in CONFIG.SYS. If you choose to omit the MVSOUND.SYS file in your CONFIG.SYS, you can select any available IRQ here in the Drivers applet. When the windows driver determines that MVSOUND.SYS is loaded, it automatically *grays out,* or disables, the ability to change the IRQ from within Windows.

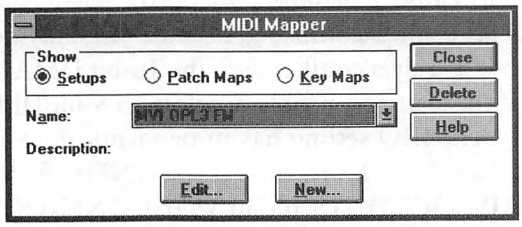
Accessing Sound Blaster Compatibility in Windows

A third driver in the Drivers applet, Media Vision Pro Audio/CDPC SndBlaster Wave, is used for accessing the Sound Blaster-compatible portion of the Pro Audio sound card. With the addition of this driver, you can simultaneously play two wave files in Windows. When you select setup for this applet, it automatically retains the setup from your DOS settings. Make sure that the settings here match those for Sound Blaster emulation specified in the CONFIG.SYS file.

Using the MIDI Mapper

The MIDI Mapper applet can also be found in the Windows Control Panel. Technically, the MIDI Mapper allows you to remap patches, notes, and MIDI channels. It uses three options: Setups (Midi Maps), Patch Maps, and Key Maps. In order for Windows to play music with your Pro Audio card, it needs to know these parameters to figure out how and what to send to the sound card.

You only need to worry about the MIDI Map being set correctly to play music with your Pro Audio sound card in Windows. Three preconfigured Midi Maps are automatically installed by Quick Start to the MIDI Mapper. If you are only using the Pro Audio sound card to play music, select MVI OPL3 FM as the default as shown in the following MIDI Mapper dialog box:



With MVI OPL3 FM selected, you can click Edit to look at the actual channels being used by the driver. Make sure the Midi Map looks like the one shown in Figure 3-4.

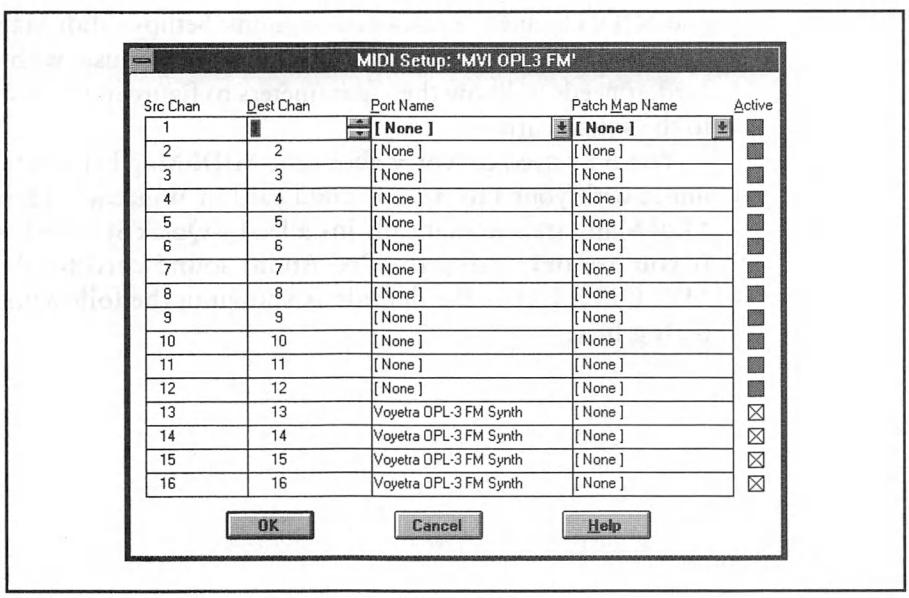
Alternatively, you can use the MVI MVFM map, which also works fine. The other MIDI Map, MVI Pro Audio, has settings for when you have another MIDI device (such as a music keyboard) attached to your Pro Audio's MIDI connector via the MIDI Mate adapter.

Windows Mixers

Media Vision provides two different mixers in Windows instead of just the one provided in DOS. Pro Mixer (PROMIX.EXE) and Pocket Mixer (PMIX.EXE) each provide a different interface for adjusting volume levels. Pro Mixer is the more comprehensive of the two, while Pocket Mixer

FIGURE 3-4

The Midi Map for the Pro Audio sound card



provides a more graphical interface like volume knobs and LED displays (see Figure 3-5).

Figure 3-6 shows the relationships between the inputs of the Pro Audio sound card and the mixer control settings.

Here are a few guidelines for making the most of your mixer.

- Keep the recording level to between 1/2 and 3/4 of maximum when making recordings.
- Adjust the master and source levels to about 2/3 of maximum, but avoid pushing them so high that the signal distorts on a particularly loud note.
- To eliminate noise from creeping in, shut off all sources that you're not recording. Do this by reducing the level of all unused inputs to 0 or switch them to "play."

An interesting feature of the two Media Vision mixers that run under Windows is that they communicate with each other. To see this, bring up the Pocket Mixer and Pro Mixer at the same time on the screen. If you adjust a volume level on one, you see the slide or dial moving on the other one at the same time. This happens automatically through Windows Dynamic Data Exchange (DDE), a powerful feature of Windows that lets programs communicate.



TIP: *The hot key combinations for adjusting volume in DOS*—CTRL-ALT-U, CTRL-ALT-D, *and* CTRL-ALT-M—*also work similarly in Windows.*

The use of the Windows mixers are well documented in the Media Vision User's Guide or Utilities Guide. Refer to them for more information on using these mixers.

FIGURE 3-5
The Media Vision Pocket Mixer for Windows

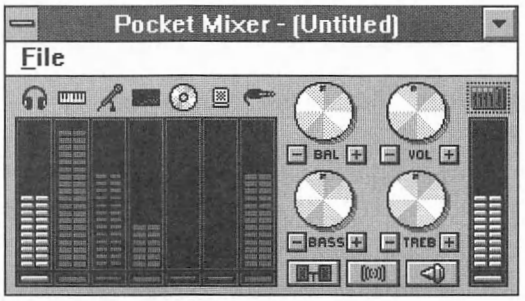
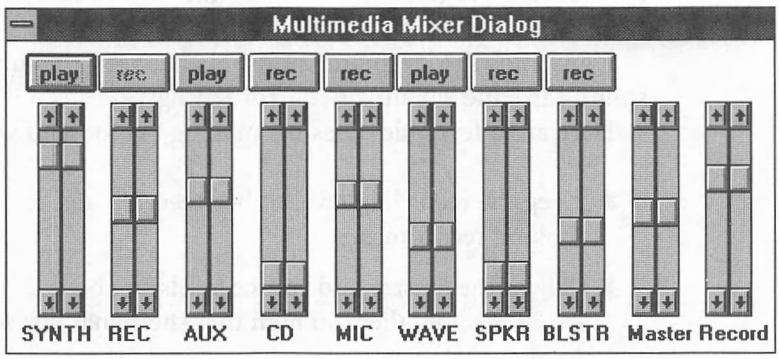


FIGURE 3-6 The Windows mixer controls various Pro Audio inputs and outputs



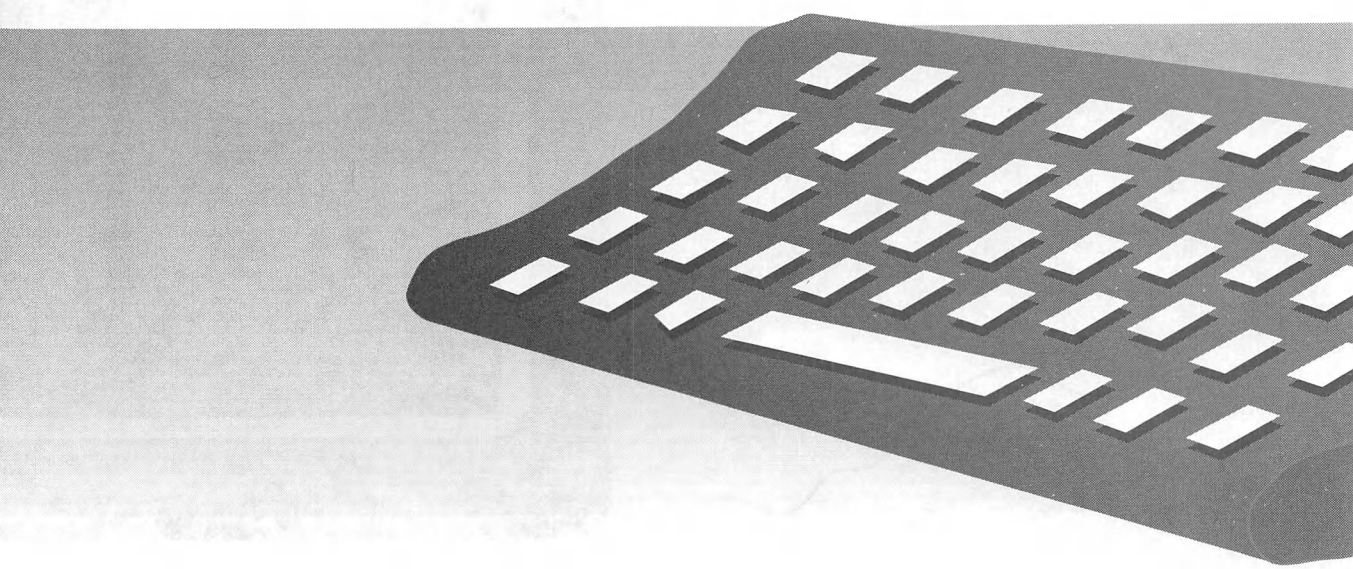
SUMMARY

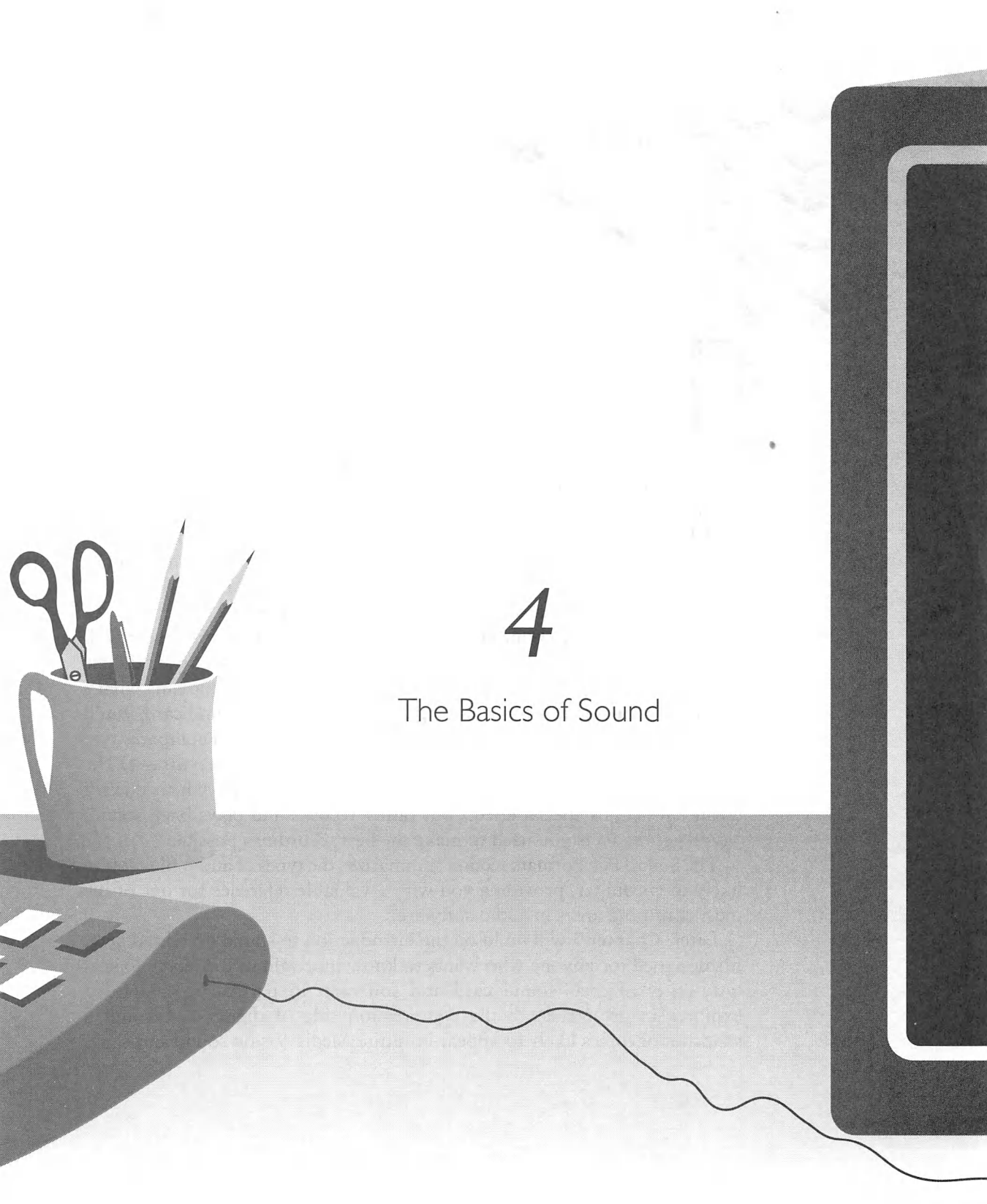
This chapter has provided you with the necessary software settings to enable your Pro Audio sound card to function properly in both DOS and Windows. The instruction manual provided with your Pro Audio sound card contain information that is invaluable—refer to it first. Don't forget the README file on the installation disks that came with your Pro Audio sound card—it contains the latest information and changes that may not be mentioned elsewhere. If you have a particular problem that has not been solved here, try looking in Appendix B of this book.

II

Understanding Sound

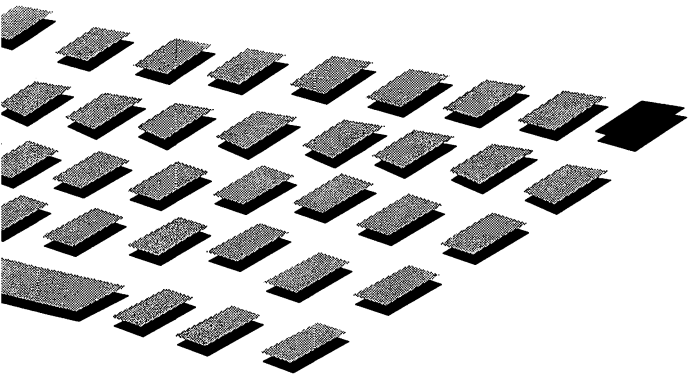






4

The Basics of Sound



THIS chapter is designed to provide a quick but essential foundation for understanding the concepts and technologies underlying sound in your sound card. The first section, Basics of Sound, presents an introduction to the science of sound (we'll spare you from dealing with formulas and math). This background is not only interesting, it is also useful for fully understanding the PC audio technology section that follows later in this chapter. Once you've got these concepts under your belt, you'll march into your computer or audio store with a new level of confidence.

The next major section, PC Audio Technologies, takes a different tack toward sound. It first talks about the audio technologies used to synthesize musical instrument sounds, such as a piano or flute note. By knowing what's really going on when you're enjoying your Media Vision sound card, you'll be in complete control of your software. Second, the section compares two technologies for music synthesis, FM synthesis and wavetable synthesis. The discussion then dives into the technology of digital audio, which doesn't create musical or special effects but rather records and plays back sound. You'll get the facts you need to make the best recordings possible.

The Sound File Formats section summarizes the types of audio files you're likely to encounter, providing you with a valuable reference for one of the most confusing areas in audio software.

Later, Chapter 5 will build on the introduction to sound presented here. It's designed for anyone who wants to know more about the technological nitty-gritty of their sound card and software. In particular, Chapter 5 explores in greater depth the compression side of digital audio and a snapshot of topics likely to appear in future Media Vision sound cards.

THE SCIENCE OF SOUND

Musicians have their own terminology for describing the contrasts in the quality of sound, such as brightness and flatness. Similarly, there are a few key technical measurements that are used by audio engineers and audio enthusiasts to describe the quality of a sound or equivalently, the ability of an instrument or device such as the sound card to reproduce a performance. Some of these key terms are bandwidth, dynamic range, distortion, and noise level, which are all discussed in this section.

The Nature of Sound

Sound is a vibration that is propelled through air, courtesy of air molecules that pass the vibration along, to our ears. The same principle applies when you toss a rock into a pond: the disturbance from the rock causes the water to fan out in all directions until the waves are so small in amplitude (or wave height) they can no longer be seen. Figure 4-1 illustrates the physical vibrations of a tuning fork that has been struck. The tuning fork vibrations force the air molecules to clump into regions of greater and lesser density, causing the air pressure to momentarily increase and decrease. The tuning fork is an excellent example of a sound source for two reasons. First, you can see the back-and-forth motion of its arms while hearing the results of this vibration. Second, the tuning fork vibrates at a constant *frequency* (vibrations per second) until all its energy has been dissipated as sound.

Figure 4-1 illustrates the disturbance of air molecules, represented by small circles. The region with very few circles is a momentary rarefaction, where the air pressure is below normal and there are fewer air molecules, while the area crowded with circles represents an area with more air molecules than normal and a higher-than-average air pressure. A disturbance traveling through air is called a *wave*, and the shape of the wave is called the *waveform*.

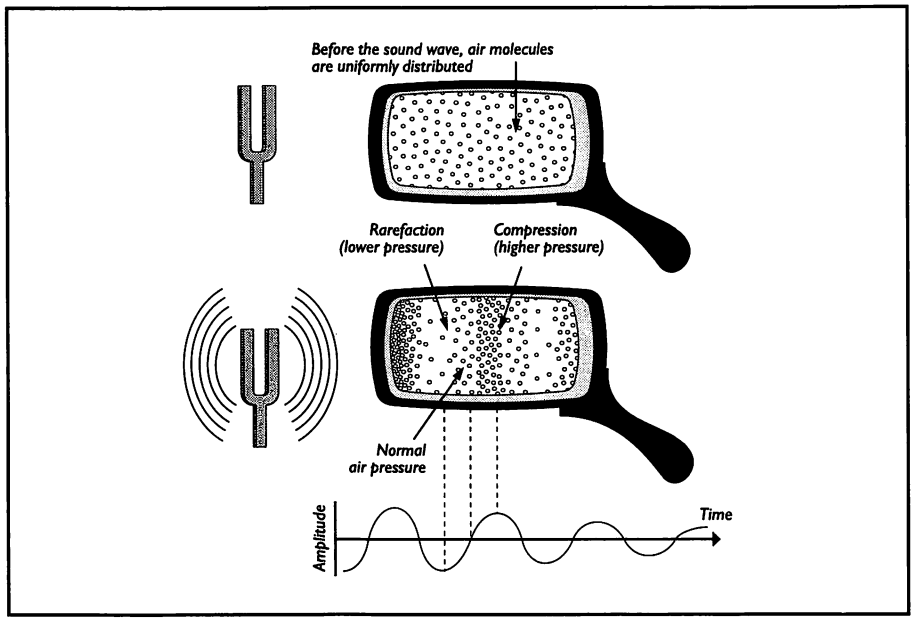


FIGURE 4-1 A simple sine wave emanating from a tuning fork

Characterizing Simple Waves

The tuning fork waveform is the simplest of all waveforms, called a *sine wave*. You may have seen waveforms like this on the screen of an electronic instrument called an *oscilloscope*. Such simple waves are characterized by their frequency and amplitude, the maximum amount of disturbance as seen by the peaks of the wave.

The frequency of sound is measured in units called hertz (Hz). A sound that vibrates once per second measures 1Hz. Frequencies are often written in kilohertz (KHz), the unit representing 1000Hz. A young person with healthy ears can hear sounds in the range of 20Hz to 20,000Hz (20 KHz).

In Figure 4-1, note how the amplitude of the wave diminishes as the sound travels away from its source, spreading in all directions. (The figure exaggerates how quickly the wave diminishes in air.)

Your ear and the microphone plugged into your sound card are remarkably similar. Both convert small variations in air pressure into an electrical signal that can be understood and stored by their respective "brains" (either the human one or the CPU in the case of your computer). A *signal* is the term for information, such as a sound, when it's been transformed from its original form—molecules bumping into each other in the air—into an electrical version that can be saved, manipulated, and played back. Later, when we talk about digital audio, we'll use the term signal frequently because we'll be dealing not with sound but rather a computer representation of it.

How Pitch Differs from Frequency

There is a subtle but important distinction between frequency and pitch. *Frequency* refers to a scientific measurement of the number of vibrations per second. *Pitch* refers to our perception of how vibrations compare. We typically speak of pitch as "low" or "high." For instance, a triangle or cymbal has a high pitch, whereas a bass guitar or a bass drum has a low pitch. In sound recording and playback, the lower range of frequencies, such as 20Hz, is referred to as bass; while the upper range, 15kHz, is referred to as treble. You may also hear the term midrange in the context of speakers, which refers to frequencies between 300Hz and 5,000Hz.

Amplitude

Measuring the amplitude of a wave is important because it tells us the *strength*, or amount of energy, in a wave, which in turn translates into the loudness we hear. If you've ever pumped your legs on a playground swing or been hit by one accidentally, you have already experienced the importance of amplitude. As you increase the amplitude of the swing, you can't help but notice how much more energy it takes to get just a bit more height. And clearly a child swinging six feet into the air packs a much bigger wallop than a child swinging only half that height.

We promised no formulas, so we'll only talk about decibels and not burden you with the formula. A *decibel*, abbreviated as dB, is a unit measuring signal strength and is useful when comparing the loudness of two sounds. The sensitivity of human hearing is extraordinary, with a very large *dynamic range* or variation in loudness. Most human ears can pick up the sound of a leaf rustling, yet can still function after being subjected to the blast of a jet engine. What's amazing is that the strength of a jet engine blast is at least 10 million times that of a leaf rustling in a breeze.

The ear requires large-percentage jumps in sound strength before a change in loudness is sensed, meaning that the ear's sensitivity to sound strength is *logarithmic*. The ear works as a logarithmic device, so the decibel, a logarithmic measurement unit, is the sensible choice to measure sound strength. The practical side of amplitude is that it increases by only 3dB when the loudness of a sound doubles. For example, a sound at 86dB has twice the strength of a sound at 83dB and four times the strength of a sound at 80dB. From the standpoint of our perception of loudness, a 3dB increase, which doubles the strength, is perceived as only slightly louder. It takes a full 10dB increase to make a sound appear twice as loud to our ears. Table 4-1 illustrates a range of sounds and how they compare in strength, as measured in the logarithmic decibel system.

Sound	Sound Strength (Pressure in dB)
In front of 12" cannon	220
	210
	200
Rocket engine	190
	180
	170
	160
Jet engine	150
Threshold of pain	140
Airport runway	130
Threshold of feeling	120
Orchestra climax	110
Rock band	100
Heavy truck traffic	90
Someone shouting	80
Noisy office/busy street	70
Normal speech	60
Quiet office	50
Quiet home	40
	30
Recording studio	20
Whisper	10
Threshold of hearing	0

TABLE 4-1 *Comparing Sound Levels* ■

Dynamic Range

No matter how good recorded music sounds, it never compares to the real thing. Much of the reason is that stereo equipment cannot duplicate the full dynamic range of an orchestra or rock concert. An orchestra can reach about 110dB at its climax, and drop to as low as 30dB at its softest, giving a dynamic range of 80dB. This is beyond the dynamic range of a typical stereo system and, in fact, is beyond the recording ability of media such as vinyl records and audio tape.

Bandwidth

Now we'll dive into practical stuff like the frequency range of a CD player and our voice. Table 4-2 shows the *bandwidth,* the range of frequencies within which electronics like our sound card and musical instruments—as well as our ears and voice—are capable of hearing or producing sound. Bandwidth is clearly important to our enjoyment of music (as evidenced by our complaint of how "tinny" a pocket radio sounds), and it is an important criteria when selecting audio equipment to use with your sound card. What's important is not the exact numbers, which will vary according to who is taking the measurement and other external factors, but to get a feeling for the relative difference.

An interesting fact is that the bandwidth of our ear is superior to that of most consumer electronics. You can see from Table 4-2 one of the reasons why FM radio stations are more pleasing to listen to than AM broadcast channels: FM stations transmit more of the high-frequency components of music than do AM stations. You can also tell, by comparing the bandwidths for the telephone and the human voice, why we sometimes mistake a person's voice over the telephone—we simply don't have all the information we normally receive to recognize the voice.



NOTE: *The bandwidth is often abbreviated to a single number when the low frequency is reasonably close to zero. For example, the bandwidth of a woman's voice is said to be 9KHz even though it really spans from about 200Hz to 9KHz.*

Sound Source or Detector	Bandwidth
FM radio (theoretical best)	50Hz to 15KHz
AM radio (theoretical best)	80Hz to 5KHz
CD player	20Hz to 20KHz
Media Vision Pro Audio sound card	30Hz to 20KHz
Inexpensive microphone	80Hz to 12KHz
Trumpet	180Hz to 8KHz
Telephone	300Hz to 3KHz
Children's ears (pre-rock music)	20Hz to 20KHz
Older ears (and rock concert enthusiasts)	50Hz to 10KHz
Male voice	120Hz to 7KHz
Female voice	200Hz to 9KHz

TABLE 4-2 *Audible Frequency Range (Bandwidth)* ■

When comparing the bandwidths of two similar pieces of equipment, such as sound cards or microphones, be certain to compare apples with apples by looking at how the bandwidth is defined. These measurements may be taken with different methods by different manufacturers, making comparisons between products from two different makers difficult. Fortunately, a fairly standard measurement exists for defining the bandwidth: the range of frequencies over which the signal amplitude doesn't depart from average by more than 3dB. The frequency at which the 3dB drop occurs is known as the *roll-off* frequency. A value of 3dB is used for the roll-off point because 3dB is the minimum change in signal strength that can be definitively perceived as a change in loudness by the average set of ears.

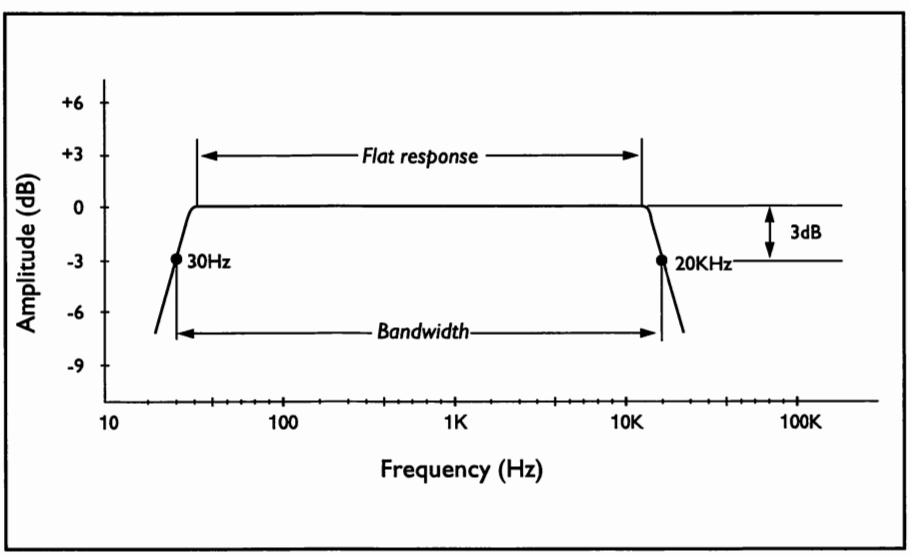


TIP: *Don't get carried away with bandwidth measurements—the ultimate arbitrator is your own ears. Sound quality, as it directly relates to speakers and microphones, is covered in Chapter 12.*

Sound Card Bandwidth

The sound card has a surprisingly wide bandwidth, effectively covering the entire range of human hearing. As the idealized plot in Figure 4-2 illustrates, the Pro AudioSpectrum 16 and Pro AudioStudio 16 sound card bandwidths extend from about 30Hz to 20KHz. Strictly speaking, this is the bandwidth for digital audio playback and record.

FIGURE 4-2
Pro Audio sound card bandwidth



System Bandwidth

It's important to note that the overall bandwidth of your sound system is dependent on the weakest link in the chain, which is almost certainly not your Media Vision sound card. The quality of sound heard from your computer system reflects the combined effort of many players, and the outcome will be no better than the performance of the least skillful—in handling sound—member of the team. In the case of your computer's sound system, a signal must pass through many stages of audio transformation and a variety of devices. For example, consider sound that is recorded from a microphone and then played back. The sound picked up by the microphone is converted to an electrical signal by the sound card, which then converts it to digital audio and stores it to disk. The digital audio on disk is later converted back to an electrical signal and played through the headphones or speakers. The effective bandwidth of your sound system is limited by the narrowest bandwidth among the devices that process your sound.

Assume you're using the highest sample rate of 44.1KHz and 16-bit samples. The weak link when recording is likely to be the microphone, which probably has a 3dB roll-off in response at about 12KHz. When playing back, the weak link is most likely to be your PC speakers, unless you really splurged on speakers.

Noise and Distortion

Just as you can be troubled by noise and echoes in a room, you can get noise and distortion from your sound card, speakers, and microphone. *Noise*—random sounds that surreptitiously slip in and mask the desired sound—is measured in decibels. Because it's no more possible to have a perfectly quiet digital audio recording environment than it is to have a perfectly quiet library, what's important is how much noise is introduced by your sound equipment, especially your sound card, relative to the signal. The strength of the music, speech, or other desired sound as compared to the average strength of noise, is referred to as the *signal-to-noise (s/n) ratio.* The higher the s/n ratio, the better the job done by the recording setup. For example, the low-noise Pro AudioStudio 16's electronic circuitry that records and plays back digital audio is rated at a very respectable 85dB s/n. A 70dB s/n ratio is considered okay for music purposes, and 65dB is borderline.

In addition to noise, the other pollutant of high-fidelity sound is *distortion,* the subtle change in frequency of components of a signal as it passes through the sound card and other audio equipment. Distortion is measured in percents, and a popular measurement is called *total harmonic distortion* (THD). Contrary to the s/n ratio, the lower the THD the better the sound.

Generally speaking, a THD of .5 percent or below is considered to be adequate, and .1 percent should satisfy the most demanding audiophiles. The Pro Audio's digital audio record and playback circuitry, as well as the output power amplifier that powers the speakers, are rated at .09 percent THD.

PC AUDIO TECHNOLOGIES

Media Vision sound cards are packed full of features and technology, some of which overlap in their capabilities. We'll discuss the key technologies, including FM synthesis, the technology for creating musical sounds on PC sound cards. We'll also discuss the digital audio circuitry of your sound card that turns your PC into a digital tape recorder.

The Variety of Sound Types

Your Media Vision sound card has a rich variety of sound types to choose from. Synthesized music is created by the FM synthesizer and, in the case of the Pro AudioStudio 16XL, by a wavetable synthesizer as well. Digital audio can be used to record and play back music and speech and other sounds. If you have a CD-ROM player you can also add audio CD sound, provided by either an audio CD disc or a CD-ROM disc, to your inventory of audio sources. Your sound card can also replicate the beeps and clicks of your PC speaker.



NOTE: *You may encounter various quality sound coming from your CD-ROM drive. A CD-ROM disc stores audio CD sound, the same as a CD player, digital audio, and possibly MIDI music. If the sound from your CD-ROM lacks the fidelity you've grown accustomed to for audio CDs, it's probably digital audio.*

Creating Music and Sound Effects

Here we introduce the audio technologies for creating musical instrument sounds: FM synthesis and wavetable synthesis. There remains a large gulf between playing an instrument note and playing a musical composition. This gulf is filled by the MIDI music language.

FM Synthesis

The remarkably simple frequency modulation (FM) technique for synthesis of music was invented by John Chowning of Stanford University in 1971. *Frequency modulation* is the subtle variation in frequency of one wave by another. Chowning discovered that by modulating one sine wave by another, a third wave rich in musical *timbre* (musical complexity or richness) could be created. The third wave consists of the two original waves, their sum and difference, and harmonics. These *harmonics*, waves with a frequency that is a multiple of the two original waves, give all types of sound—including FM synthesized instruments—its unique timbre.

The FM synthesizer is the most popular electronic technology for creating musical sounds. All Media Vision sound cards have an FM synthesizer, and it works just like the one on a Yamaha keyboard synthesizer. The FM synthesizer (which musicians abbreviate to "synth") produces a wide range of sounds, both music and special effects. In recent years, FM synthesis technology has been reduced by Yamaha to a single chip smaller than a fingernail. Virtually all the electronic music heard from your PC.

FM SYNTHESIZER ON YOUR SOUND CARD Built with the newer Yamaha YMF262 (OPL3) FM synthesis chip, Pro Audio sound cards can produce FM synthesized sound in stereo using either two-operator or four-operator synthesis. In two-operator mode, the FM synthesizer can generate up to 16 melody sounds and 6 percussion sounds, like a tom-tom or snare drum. The *melody sounds* are instrument sounds set up by software, probably a software driver, and these sounds can be changed by music software programs that send new instructions to the FM synthesizer chip. The *percussion sounds* were programmed into the chip when it was made in the factory, so your music software has limited control over them. In four-operator mode, the FM synthesizer can support up to six melody sounds and five percussion sounds. The earlier Pro AudioSpectrum 16, Pro AudioSpectrum Plus, and the original Pro AudioSpectrum were designed before the YMF262 was available. These contain a pair of monaural Yamaha 3812 (OPL2) chips to create stereo sound. The Thunder Board, which produces monaural sound only, contains a single 3812 chip.

Figure 4-3 illustrates two-operator FM synthesis and shows how the Yamaha chip's modulator cell modulates the second cell, the carrier cell. The *carrier cell* determines the base frequency of the tone while the *modulator cell* determines the overtones that give the tone its unique timbre. In four-operator mode, two pairs of cells are connected in series, resulting in timbre that's richer than two-operator mode.

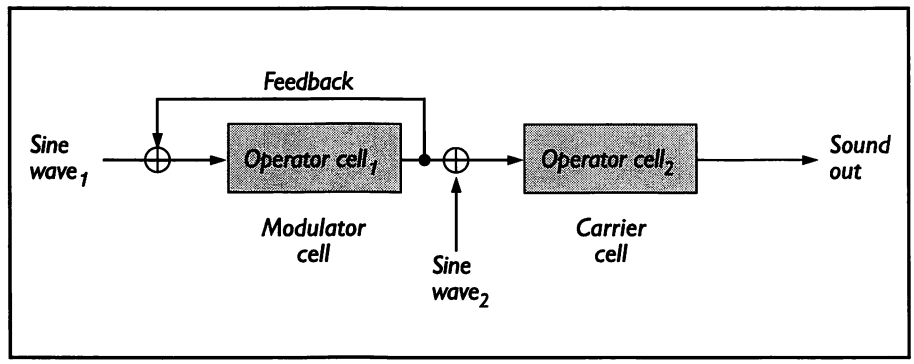


FIGURE 4-3
Two-operator FM synthesis

By carefully programming the parameters of the FM synthesizer, a wide variety of musical instrument and special effect sounds can be created. A particularly valuable feature of the Yamaha FM synthesis chip—its ability to handle the work involved in creating musical sound, saving your CPU the burden—has led to its adoption by most sound cards. To get the full story on how to program the FM synthesizer, you should purchase the Pro AudioSpectrum Developer's Toolkit, described in Appendix D.

DRAWBACKS TO FM SYNTHESIS There are two drawbacks to the FM synthesis technique. The most serious drawback is that the music sounds just "okay." You recognize a flute sound as that of a woodwind instrument, but even a five-year-old child listening to it might say, "Isn't that a weird flute?" A second drawback comes from the fact that the basis of FM synthesis bears little direct relationship to the physics of most musical instruments, so the creation of sounds to resemble familiar instruments must be done by trial and error. In less polite and more scientific terminology, FM synthesis is a "black art."

Wavetable Synthesis

To date, the most common technique for synthesizing the sound of musical instruments has been the FM technique. However, another technology called wavetable synthesis is on the march and will ultimately take over when its cost comes down.

Wavetable synthesis works by digitally manipulating a representative sound sample to create the complete range of notes. These notes are digitally processed to adjust their pitch and to add in keyboard velocity or bowing intensity and other performance effects like tremolo, a slow, subtle variation in the strength of a note as it's played.



NOTE: *You may have already been touched by this music technology if you've played one of those amazing electronic pianos that sound remarkably similar to the real thing. Many of these electronic marvels have switches on them, so by flipping a switch and closing your eyes, you can be playing a harpsichord or grand piano instead.*

Media Visions's Pro AudioStudio 16XL is the first Media Vision sound card to sport this new technology. A Pro AudioStudio 16XL, with a wavetable synthesizer *daughterboard* (a little card that plugs into the sound card) attached, turns the PC into a professional-caliber music studio. The wavetable daughterboard contains 4MB of read-only memory (ROM) that contains digital samples of genuine instruments. These samples provide much more realistic instrument sound than is possible with 4-operator—or even 8-operator—FM-synthesized sound. The wavetable instrument samples are 16-bit CD-quality audio samples. In addition, the daughterboard has reverberation and chorus effects built-in.

Creating Musical Compositions with MIDI

While FM synthesis and wavetable synthesis are technologies for playing notes, MIDI is the technology that allows playing a musical composition comprising hundreds of notes. A MIDI file contains the same information that you see on a musical score on paper: a list of notes of varying duration and pitch, with tempo, phrasing, and much more. To learn more about the elements of the MIDI language, please refer to Chapter 8, which is dedicated to MIDI.



NOTE: *Software drivers are the bridge between software programs that play MIDI music and the hardware, either an FM synthesizer or the wavetable synthesizer of the Pro AudioStudio 16XL, that actually creates the sound of the note. These drivers are discussed in Chapter 3, "System Software and Drivers."*

Recording and Playing Audio: The Basics of Digital Audio

Before your computer can record, manipulate, and play back sound, the sound must be transformed from an audible analog form to a computer-friendly digital form by a process called *analog-to-digital conversion* (ADC). Once sound data is stored as computer bytes, you can tap the power of your computer's CPU to massage this sound in a thousand ways. With the right software, for example, you can add a reverberation or echo to music or speech. You can eliminate pieces of speech, like the "not" in a recorded statement. You can mix sound files together, adjust the pitch so the voice can't be recognized, and so forth. Finally, when you're ready to hear your masterpiece, the *digital-to-analog*

conversion (DAC) process converts the sound bytes back into an analog electrical signal that comes out of the speakers. The pulse code modulation (PCM) circuitry in your sound card that handles ADC and DAC is excellent, almost comparable to that in CD players, so you're more likely to be limited by your imagination than by the performance ability of your sound card.

Sampling: Analog to Digital Conversion and Back

Let's begin with capturing sound using the microphone. When sound waves reach the microphone's diaphragm, the mechanical motion is translated into an electrical signal. This signal is called an *analog signal* because it is a continuously changing signal, truly analogous to the original sound.

ANALOG-TO-DIGITAL CONVERSION (ADC) The ADC process converts this continuous analog signal to a series of discrete digital values by *sampling*, taking measurements of the instantaneous amplitude of the signal, at a constant rate. If the measurements are done at a sufficiently high sampling rate, such that the signal waveform doesn't change much between samples, the ADC process can do a good job approximating the analog sound wave. Figure 4-4 shows how analog-to-digital conversion works. Notice that the continuous wave is approximated by a series of 8-bit point values, varying in value from +128 to -127, which will be stored as bytes in a disk file. The section discussing sample size will clue you in on how to make a more faithful replica of your sound by using the larger 16-bit sample size.

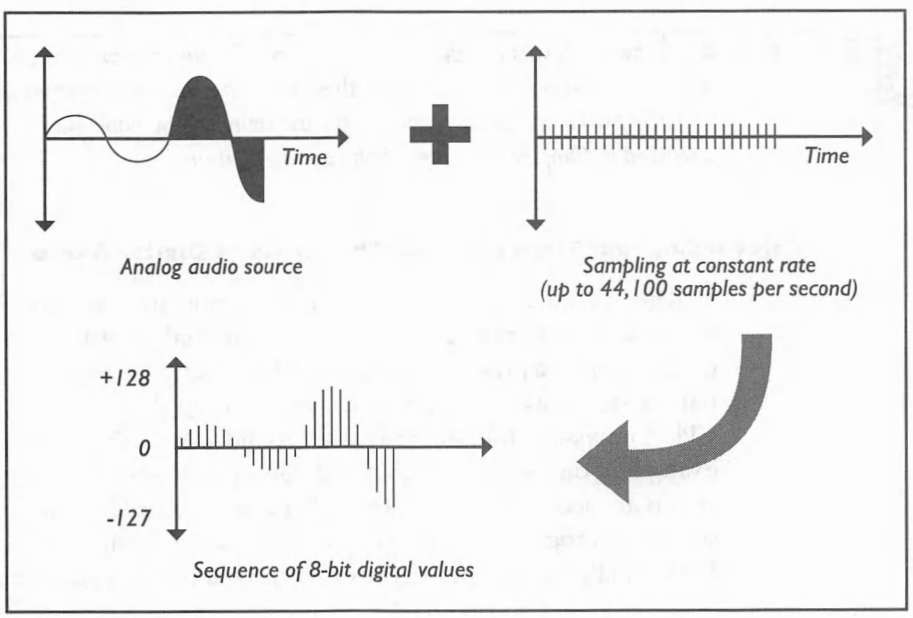


FIGURE 4-4 *Analog-to-digital conversion (ADC)*

DIGITAL-TO-ANALOG CONVERSION (DAC) The DAC process converts the discrete digital values representing the sound into a continuous analog signal by using a smoothing filter to round out the rough edges, as shown in Figure 4-5. Digital audio stored on disk is represented in Figure 4-5 by a tape reel with data bytes. The roughness of the reconstructed analog signal waveform has been very much exaggerated in order to emphasize the analog-to-digital conversion technique.

Sampling Rate and Sample Size

The *fidelity*—audiophile terminology for the faithfulness in replication of the original music—of digital audio sound is dependent on the judicious selection of the correct *sample rate*, the number of samples taken per second and the *sample size*, the number of bytes used to store each sample.

SAMPLE RATE The sample rate must be high enough that high-frequency sounds, such as the ringing of a crystal wine glass or the bowing of a violin, can be captured accurately. According to the *Nyquist theorem* (it's got to be a real theorem with a name like that) you can faithfully replicate a waveform only if the sample rate is at least twice the frequency of the highest frequency component. The highest frequency that the human ear can perceive is slightly over 20KHz, so the Pro Audio's top sampling rate of 44.1KHz should be more than adequate. This is the same rate used by today's audio CD players.

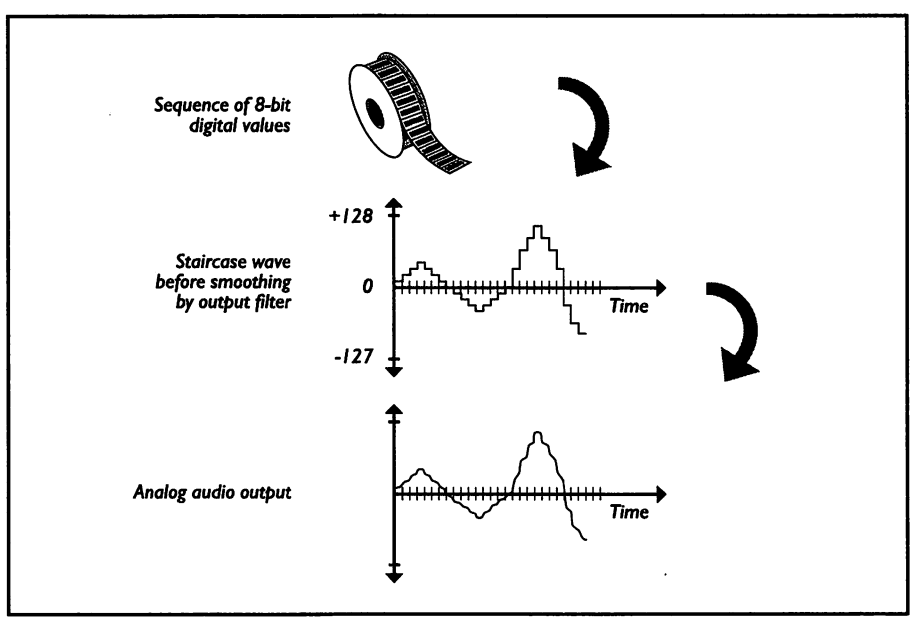


FIGURE 4-5 Digital-to-analog conversion (DAC)



NOTE: *According to many audiophile enthusiasts, CD audio lacks a certain richness in sound. This is partially due to the sample rate being just a tad too slow to accurately reconstruct the highest frequency components. The complication is that an input filter, circuitry used to block high frequency noise from infiltrating the recording, is not a perfect device to block all frequencies above a certain frequency while perfectly passing all others below. Because the input filter has its own roll-off, which adds to the roll-off of the digital circuitry, the sound card's effective bandwidth is reduced slightly from the theoretical maximum. While 44.1KHz sampling can, in theory, record frequencies as high as 22.05KHz, in practical implementation the bandwidth is more like 20KHz, which just barely matches that of the human ear. In fact, commercial recording studio equipment uses a sample rate of 48KHz for this very reason.*

SAMPLE SIZE The sample size is the other major influence upon the fidelity of digital audio. The 16-bit Media Vision cards offer a choice of either 8-bit (1 byte) or 16-bit (2 byte) digital audio sample size. Thunder Board, designed to compete against Sound Blaster, matches Sound Blaster in handling only 8-bit samples. While the MPC Level 1 specification requires 8-bit samples, the MPC Level 2 specification dictates 16-bit samples. (See Chapter 1 for MPC specifications.)

The sample size controls the dynamic range that can be recorded. For example, 8-bit samples limit the dynamic range to 256 steps (50dB range). In contrast, a 16-bit sample has a dynamic range of 65,536 steps (90dB range)—a major improvement. The human ear perceives a world of difference between these two sample sizes. Your ears are more sensitive to detecting differences in pitch than differences in loudness, but they are still remarkably sensitive to sound strength. Human ears accustomed to detecting sounds that vary in strength by orders of magnitude perceive 8-bit sound as dull or flat in tone when compared to 16-bit digital audio sound.

TRADE-OFFS IN SAMPLING The motto "there is no such thing as a free lunch" clearly applies to digital audio. So far, based on what you've read, all you have to do to get great sound is to record at the top speed of 44.1KHz with 16-bit (2 byte) samples. The only problem with this recipe is the cost. Assuming you're recording in stereo, with left and right channel samples taking place simultaneously at 44.1KHz, a one-minute sound sample requires a mere 10.58MB (you read it correctly—ten and a half million bytes!) of storage. If you've already bought a system with 20MB of memory to run Windows NT, you can store almost two minutes of digital audio in your system's RAM memory before your computer flashes an "out-to-lunch" message at you. The rest of us have no choice but to send that data directly to disk, but at over 10MB a minute you're likely to run out of disk space before you've had time to put a sandwich together.

The bottom line regarding digital audio is that you must follow the following guidelines to conserve on storage:

- Record in monaural rather than stereo.
- Use the lowest sample rate practical.
- Use 8-bit samples rather than 16-bit samples for speech and sound effects whenever possible.

A sure method to save disk space is to record sound in monaural instead of stereo. With monaural you take only one sample at a time, while with stereo two samples are taken for each point of time, one for the left channel and one for the right. If you're recording from the microphone, you don't have any choice because the microphone input is only monaural.

Use the lowest possible sample rate. For example, suppose you're planning to record a telephone conversation. The bandwidth of a telephone, as listed in Table 4.1, is only 3KHz. According to the Nyquist theorem, you'll do an adequate job of recording by using a sample rate of 6KHz or better.

When selecting the sample rate, also consider the overall bandwidth of your system. For example, there's not much point in recording digital audio at 44.1KHz if your microphone performance drops off at 12KHz and the sound source is a gravelly male voice that doesn't go much beyond 7KHz.

While you'll want 16-bit samples for faithful reproduction of music, you can get by with 8-bit samples for special effects and for speech. Special effects are almost always a little noisy, so they're an especially good match for 8-bits and a slow sample rate. In the case of speech, try recording the sound with 8-bit samples, and if it sounds okay, you've just saved 50 percent in storage.

Digital Audio Compression

Sound files are particular about compression, so you may not gain much by using a familiar compression utility program like LHARC or PKZIP or even a disk-doubler utility. What audio files need are compression utilities containing software *algorithms,* or mathematical techniques, that understand what sound "looks like." Only if the software understands the format of sound can it do a decent job of compressing sound without losing much in the way of fidelity. The version of Pocket Recorder that was first shipped with the Pro AudioStudio 16 is the first version of Pocket Recorder to feature compression. The technique used by Pocket Recorder is discussed further in Chapter 5.

SOUND FILE FORMATS

Have you wondered whether an exotic shareware sound file on a bulletin board—TARZAN.YEL, for example—is worth downloading to your computer? Sound on the modern IBM PC-compatible computer has flowed from many tributaries, resulting in many different types of sound file formats, different ways in which sound is stored on disk, and different file extensions to distinguish among these formats. Each software program can usually read only a few file formats, so you should know a little bit about who uses what format before racking up a big telephone bill on CompuServe or buying a stack of useless shareware disks. Hardware platforms featuring their own unique brand of sound and sound files include the Commodore Amiga, Apple Macintosh, and of course the original IBM-PC. With the arrival of Microsoft Windows, computer sound on the PC has been given additional file formats.



TIP: *You can convert between many of these different file formats by reading a file into a program and then saving it to another format. For example, Midisoft's Recording Session works best when you store your MIDI music composition in Midisoft's proprietary Song (SNG) file format. This isn't a problem because you can later save the file to Standard MIDI (MID). You may also be able to obtain utility programs that translate from one format to another.*

The file formats for personal computing you're most likely to see are described in the following list of file formats. The list is ordered by file format name (the usual extension is in parentheses), and a short description of how each file format is used.



NOTE: *The term* block *is sometimes used in describing the internal architecture of a file format. A block is a subdivision of a file, similar to a block as a subdivision of a city. Each block or "chunk" of information contains information of the same type, such as 16-bit digital audio or MIDI music.*

AUDIO INTERCHANGE FILE FORMAT (IFF) The Audio Interchange File Format (IFF) is used by the Apple Macintosh for storing digitized audio sound samples. It supports a variety of sample rates and bit widths up to 32 bits per sample. A nice feature of this file format is that it supports loops. This file format traces its lineage to Elecronic Arts, which years ago tried to develop industry-standard file formats for graphics, text, and sound samples.

This file format is also used on the Commodore Amiga. It's unlikely you'll see this file format for run-of-the-mill IBM PC sound applications.

CREATIVE MUSIC FORMAT (CMF) The Creative Music Format (CMF) is one of two file formats promoted by Creative Labs for storing music. The CMF file is designed to work with the industry-standard Yamaha chip used for synthesizing FM music. A CMF file embodies an instrument block, which in turn contains the parameters for programming the FM synthesizer on the sound card with the desired instrument sounds. The musical notes are stored in a music block, which adheres to the Standard MIDI File Format. A related file format is Creative Lab's Sound Blaster Instrument (SBI) format, which, like the instrument block of the CMF file, stores the parameters for creating instrument sounds. Up to 128 instrument voice parameters are stored together in a Sound Blaster instrument bank (IBK) file.

MIDI (MID) Should you need to share a MIDI file with a friend, save the file in Standard MIDI, the universal language of the MIDI music world, both amateur and professional. You'll most likely be exposed to two variations of "standard" MIDI with your Media Vision software. Standard MIDI Type 1 is the more modern variant of MIDI, which faithfully preserves your composition as a multi-track score. The older version, Type 0 format, is provided for compatibility with early sequencers. Type 0 isn't recommended, because it supports one track only.

MOD (MOD) MOD (pronounced "mod" as in "modern") files are an inheritance from the Commodore Amiga where it's probably the most popular music file format. The unique characteristic of MOD files is that they contain digitized audio samples of actual musical instruments. When MOD files are played back, each note is played by taking the sample instrument sound for that note and playing it slower or faster to give the correct musical pitch. MOD files generally contain four channels of music, and each channel is devoted to a single instrument sound.

MOD files have several nifty features. They can contain up to 31 different instrument voices (although only four to eight can be played at one time), each of which can be set to its own volume. Also, an instrument sound can be repeated indefinitely to create an echo or reverberation effect. Each note can be assigned special effects such as vibrato, a slow flutter in amplitude, and an upward or downward slide in the pitch. All of these features combine to produce great-sounding music.

Unfortunately, MOD files have several disadvantages. The files are relatively large. Probably a more serious disadvantage is that MOD files exist in many varieties, so not all MOD files will play properly on all MOD players. TrakBlaster Pro (the MOD player shipped with Media Vision's 16-bit

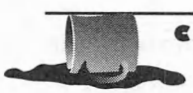
sound cards) MOD files have a .MOD file extension, contain four channels of music, and are relatively standard MOD files. There's a large selection of MOD files that can be downloaded from Media Vision's bulletin board.

RIFF (RMI) The Microsoft Resource Interchange File Format (RIFF) is designed to be the end-all-be-all file format for Windows multimedia, capable of embedding "chunks" (Microsoft's term for blocks) of many different data formats. These formats include Wave (WAV) digital audio and MIDI chunks. The beauty of RIFF is that it can accommodate block types that haven't yet been invented. So far RIFF hasn't become wildly popular. See the description of Wave (WAV) files (a file type that can also be a RIFF chunk).

ROLL (ROL) Roll (pronounced "roll") files originated with the Visual Compuser, a software program provided by AdLib, Inc. for use with their AdLib sound card. The ROL file format was designed to support music on the Yamaha FM synthesizer chip on the AdLib card. Because all Media Vision sound cards contain the same Yamaha chip, ROL files can be played on your Media Vision sound card if you have a suitable music utility program. Similar to the CMF file, the ROL file contains a list of notes, tempos, and instrument changes, although they are organized less efficiently than CMF.

SOUND (SND) The Sound Resource (SND) file format is a compact—only 8 bits per sample—digital audio file format supported by Apple. It's used for uttering short sounds, such as an alert sound on the Macintosh built-in speaker, and for use by Macintosh applications such as HyperCard when they have simple sound requirements.

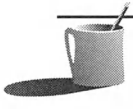
STUDIO (SNG) Midisoft's Recording Session, a MIDI sequencer program, has its own format called a "Studio" file that has an .SNG file extension. This file format is the best choice while working with Recording Session, because it preserves the mixer settings, has fancy scoring notation seen in the Score View, and can be saved later as a MIDI (MID) file.



CAUTION: *You have to be wary of the .SNG file extension, which is used by other sequencer programs to save music files. For example, Voyetra uses the .SNG file extension for their line of Sequencer Plus (SP) MIDI sequencer programs, and these files are incompatible with Recording Session's SNG files.*

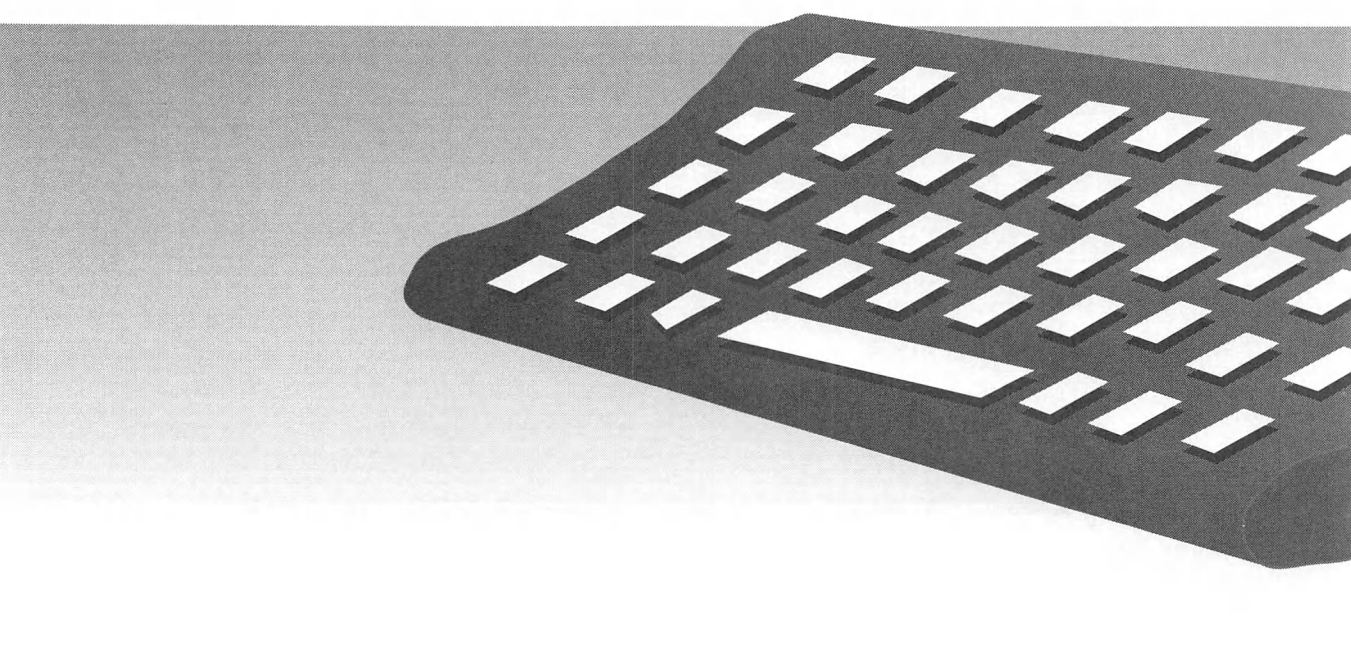
TURTLE SMP (SMP) Turtle Beach Systems, writers of great music software, has its own 16-bit digital audio file format called SMP that applies to only their sound card.

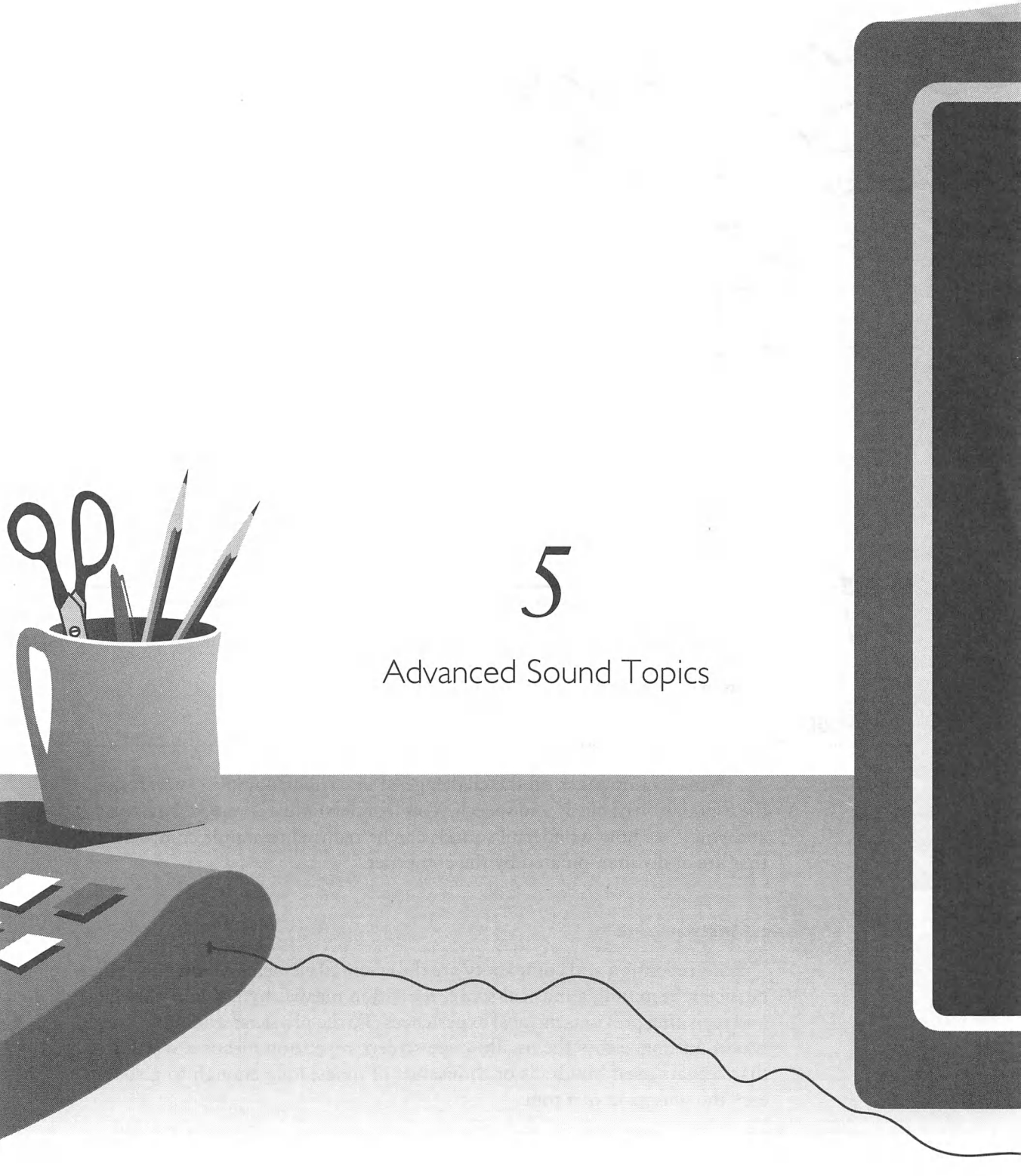
VOICE (VOC) Creative Labs popularized the Voice (VOC) file format for digital audio. It contains 8-bit digital audio samples that can be recorded in a wide range of sample rates. The data can be stored either as uncompressed 8-bit samples or in one of three compressed formats: 2-, 2.6- or 4-bits per sample. Special features of this file format include its ability to repeat a block, to add markers that multimedia presentation programs can use to synchronize sound with multimedia graphics, and to silence blocks which replace silence periods with a small marker. Voice files are rarely used in the Windows environment; Microsoft's Wave file format is dominant.



NOTE: *You're unlikely to encounter compressed VOC files, unless you create them yourself. Few commercial products incorporate compressed VOC sound files because the sound quality is poor.*

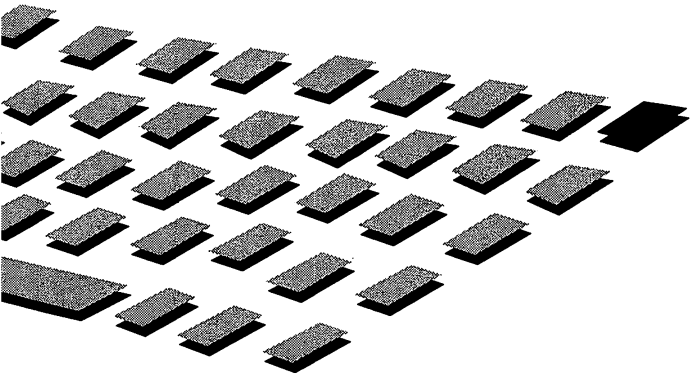
WAVE (WAV) Microsoft adopted the Wave (WAV) file format for use with multimedia extensions to Windows. It stores either 8-bit or 16-bit digital audio samples, handles monaural as well as stereo data, and supports three sample rates: 11.025KHz, 22.05KHz, and 44.1KHz. This file format is supported by virtually all Windows-based multimedia applications and sound cards. The raw sound data, stripped of the headers and other descriptive information, is identical to the digital audio found on CD-ROM discs. One drawback to Wave is that it doesn't support looping of sound blocks.





5

Advanced Sound Topics



THE purpose of this chapter is to build upon and go beyond the audio essentials presented in Chapter 4, "The Basics of Understanding Sound." This chapter navigates through the more esoteric and technical subjects that will prove fascinating once you've mastered the basics. We'll discuss complex waveforms, digital audio sampling, and audio compression technology featuring ADPCM, and we'll review the leading edge technologies of digital signal processing and waveguide synthesis.



TIP: *If you encounter unfamiliar terminology while reading this chapter, please review Chapter 4 for an overview of the basic principles of sound.*

COMPLEX WAVEFORMS

This section takes on the challenge of describing complex waveforms, the foundation of music and speech. You'll understand a complex waveform, and you'll see how wonderful sounds can be reduced to simple components that are easily manipulated by the computer.

Musical Instruments

Both repetition and complexity are the essential elements of music. To the musician humming a musical score, repetition means rhythm and phrasing and revisiting previous musical experiences. To the physicist watching sound waves pulsing across the oscilloscope screen, repetition means a waveform that repeats itself hundreds or thousands of times, long enough to give our ears the sensation of a tone.

The essence of music is also its complexity. Music that is described as rich in texture or timbre has a complex waveform. Figure 5-1 shows the complex waveform that might be associated with a real instrument.

Speech

It's been said that of all musical instruments, the human voice is the most versatile and expressive, with the richest timbre. You witness this every time you recognize a friend's laugh over the telephone or the voice of a favorite singer on the radio. The repetitive quality of speech is evident in the phonetic building blocks of speech. These building blocks are a relatively small set of the many possible sounds humans are capable of uttering. Chapter 7, which describes Media Vision's speech software, provides more detail on these fundamental building blocks and the characteristics of speech.

Scientific research in the area of speech over the last several decades is now having a practical impact in audio technology, such as waveguide synthesis, which is discussed later in this chapter.

Reducing Complex Waveforms to Simple Components: Fourier Analysis

The intriguing fact about complex waveforms, whether their source is a musical instrument, a human voice, or the vibration of a machine, is that they are actually composed of simpler waves. According to Fourier's (pronounced "fo-yea") theorem, every complex periodic wave is actually a series

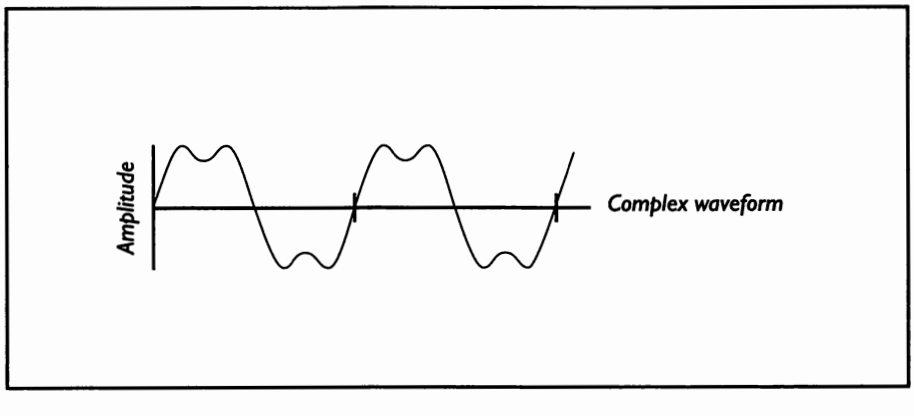


FIGURE 5-1 A complex waveform created by a musical instrument

The Male Opera Singing Voice

Many of the secrets of the singing voice have been unlocked by science. Normal male speech finds its greatest strength at about 450Hz, which happens to be the same frequency at which an orchestra reaches its peak of strength. Having the same peak frequency makes it difficult for the male voice to be heard above the orchestra. The very interesting characteristic of the male opera voice is that the peak strength of the voice has been pushed upwards by the singer, into the 2500Hz to 3000Hz bandwidth. Remarkably, the singer accomplishes this higher peak without having to exert himself beyond the effort required for normal speech. This higher frequency peak is ideal for voice projection because it's strong in the frequency band where the orchestra is weak, soaring above the orchestra music. At the same time, this peak falls comfortably within the bandwidth where the singer can exert good control. Inheriting the right genes is definitely beneficial. A man with a larynx that resonates (naturally reverberates) in this range has an innate advantage over other men in developing an operatic voice.

(family) of simple sine waves that includes many harmonics. *Harmonics* describes the relationships between waves, shown in Figure 5-2, where the waves have frequencies that are multiples of the so-called *fundamental frequency*, the dominant (strongest amplitude) wave. The second harmonic wave has twice the frequency of the fundamental wave, and the third harmonic has three times the frequency of the fundamental.



NOTE: *As an aside, the topmost waveform in Figure 5-2 depicts the sound of concert A, the note used by orchestras for tuning. This has a frequency of 440Hz in the United States, but is 442Hz or higher in Europe.*

Fourier's theorem predicts that a complex wave can be reduced to a series of simple waves. The opposite is just as true, that a series of simple waves can be combined to create a complex wave, and this is illustrated by Figure 5-3. Add the heights of the two simple sine waves, at every point of time, and the result is the complex waveform first seen in Figure 5-1.

Here's the practical payoff of Fourier's theorem. There are special audio effects that can only be performed by manipulating the sound that falls into a narrow range of frequencies. For example, a cheap microphone may excessively boost the signal at 10KHz but otherwise perform reasonably well with a flat bandwidth. By a technique called *equalization*, the shaping of the frequency response of a signal, the components around 10KHz can be reduced in strength, creating a signal that sounds like it has been recorded

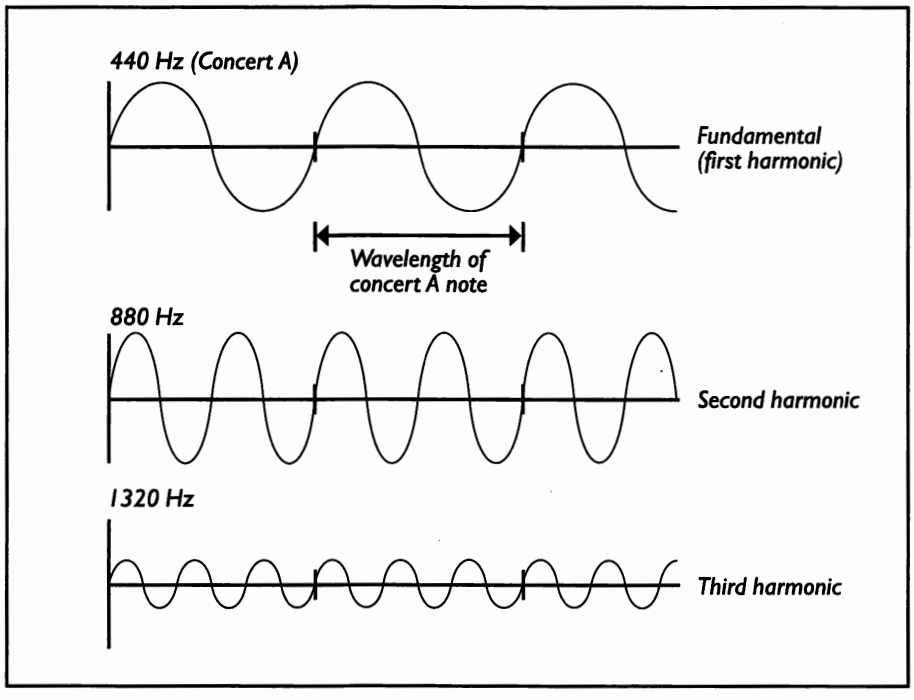


FIGURE 5-2 A Fundamental frequency (concert A) and two harmonics

with a much better, flatter bandwidth microphone. This shaping can be done by a digital computer such as your PC, using a computer *algorithm* (a simple

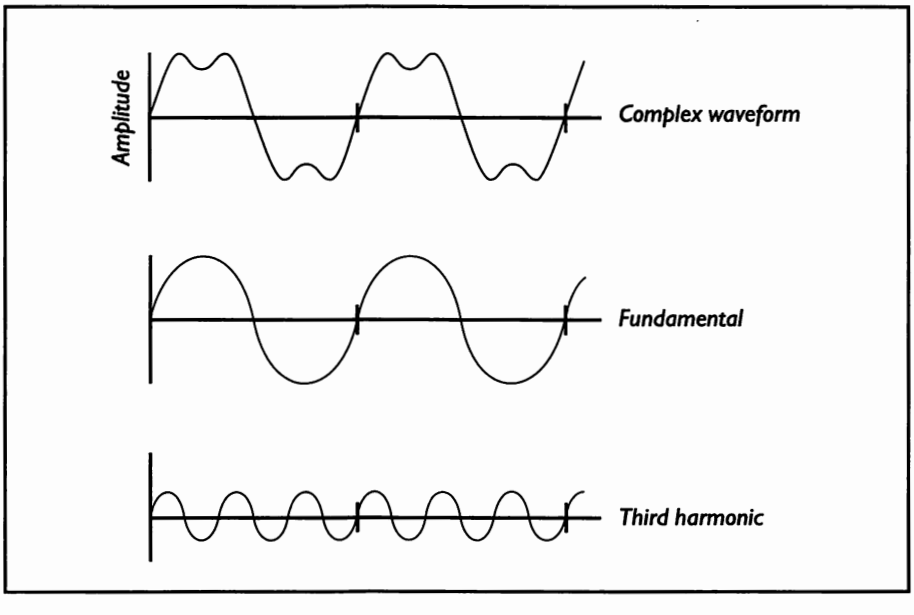


FIGURE 5-3 Complex waveform consisting of two simple sine waves: a fundamental frequency and its third harmonic

set of computer instructions) known as the *fast Fourier transform* (FFT). This particular example of equalization can also be done with inexpensive analog audio circuitry costing only a few dollars. More complex equalizations, however, and special effects like changing the playback speed of a voice without changing the person's pitch, can't be easily accomplished with analog circuitry. FFT technology is also the foundation for most speech recognition software and a host of commercial and military applications.

MASTERING DIGITAL AUDIO SAMPLING

Media Vision's software that records and plays back digital audio automatically selects the proper input filter setting for your choice of sampling rate, protecting you from making an error. Since software provided by other companies may not perform the same hand-holding, this section will tell you how to drive your PCM circuitry when you're handed the steering wheel. This discussion assumes you're already familiar with the basics of digital audio presented in Chapter 4.



NOTE: *The PLAYFILE and RECFILE utility programs are the only ones provided by Media Vision for which you can disable the automatic selection of the proper filter setting. With these utilities you can experiment with any sample rate and filter setting.*

The Input Filter

As mentioned in Chapter 4, Pro AudioSpectrum contains both an input and output filter. The input filter is absolutely essential for successful operation of the PCM circuitry that records digital audio. The input filter is

The Rainbow

If your eyes began to glaze over when you read "wave theory," "Fourier's theorem," and "algorithm," feel free to forget about everything you've just read, relax for a moment, and visualize a rainbow. Here's an example of Nature taking a complex waveform—sunlight—and with the assistance of tiny rain drops separating the white light into its constituent simple waves—the pure, rainbow colors you see.

a low-pass digital filter that freely passes signals below a certain frequency while blocking signals above that frequency. The input filter can be set for any of the *roll-off frequencies*, the frequency above which the signal is reduced in strength, shown in Table 5-1. The input filter can also be disabled so that the signal is not filtered, which is useful for experimentation only.

In Table 5-1 the sample rate is the number of times each second that the signal is sampled. The Nyquist limit frequency is one-half the sample rate: this is the highest frequency in the signal that can be sampled without introducing a type of signal distortion called *aliasing*.

Aliasing

The correct setting for the input filter prevents *aliasing*, a type of signal distortion where low-frequency *false* sounds, sounds that never existed, show up in your recording. Aliasing occurs if the sampling rate proves too low to accurately sample the higher frequency components of the sound you're recording. For example, suppose you select the sample rate of 11.025KHz to record speech. According to the Nyquist theorem, this rate is adequate for recording sound as long as the highest frequency you're recording doesn't exceed about 5.5KHz (safe bet for a deep-voiced adult, but not so safe for recording a young child's voice). If there's a frequency component in excess of the Nyquist limiting frequency—perhaps a toddler screaming—a false sound with a frequency that's the difference between the two will be created by the PCM circuitry that does digital audio sampling.

Sample Rate	Roll-off Frequency	Nyquist Limit Frequency
44.1 KHz*	17.9KHz	22.05 KHz
32 KHz	15.9KHz	16 KHz
22.05 KHz*	11.9KHz	11.025 KHz
18 KHz	8.9KHz	9KHz
11.025 KHz*	6.0KHz	5.512 KHz
8 KHz	3.0KHz	4 KHz

*The three standard sample rates for Microsoft .WAV digital audio files

TABLE 5-1 *A List of Filter Settings and Their Matching Sample Rates* ■

A Cinema Example of Aliasing

Since a false sound is a pretty strange concept, here's a way you can visualize what happens if Nyquist's theorem is violated. You've seen a false image due to aliasing if you've ever watched a vintage Ben Hur flick at the movie house. During the scene showing two horse-drawn chariots with spoked (and spiked) wheels racing across the plains, you may have been surprised to see the chariot wheels appearing to slowly rotate backwards. What happened is that the movie camera's sampling rate of 30 frames per second wasn't fast enough to accurately capture the image of the spinning wheel. Recalling Nyquist's theorem, the sampling rate must be twice the highest frequency component you're trying to record. In the case of the spinning chariot wheel, the spokes are passing by a given compass position at a rate slightly faster than 15 times per second. For example, if the spokes pass a given point at 17 times a second, the wheel will appear to be rotating backwards at the difference, 2 rotations per second.

AUDIO COMPRESSION

In this book we've mentioned several times that digital audio sound files will rapidly take up a lot of real estate on your hard disk—as much as 10.5MB per minute. Fortunately, sophisticated compression schemes exist that reduce the audio file to a more manageable size, to as little as one-half to one-quarter of the original size. This means that a compressed 44.1KHz stereo file will take up the same amount of space as an uncompressed 22.05KHz mono file.

Audio Compression Requirements

Audio files are fundamentally different than the other data files you work with, and they consequently require a different style of compression. For example, spreadsheet, word processing, and other files consisting of text and numbers contain lots of repeating characters such as spaces and lines. You can compress these files, using a general-purpose file-compression tool such as PKZIP or LHARC, to as little as one-fifth of their original size. This type of compression program doesn't do a good job of compressing audio, since by its nature audio (and video) continually changes. Even so-called "silent" periods are rarely devoid of sound. Consequently, a more sophisticated method of compression is necessary, one designed to take advantage of the characteristics of sound.



NOTE: *The VOC format used for 8-bit digital audio files in the DOS world has the concept of "silence" blocks, in which an extended period of near silence in the audio file is replaced with a small marker and a time-duration value. You may notice this when playing games that feature digital audio. This scheme works relatively well, but it's not supported by most sound file formats. In particular, Microsoft's Wave format doesn't support silence blocks.*

Linear Pulse Code Modulation

Chapter 4 describes how sound is converted by pulse code modulation circuitry from analog to digital and back to analog. Each sample is assigned an 8-bit or 16-bit value that's proportional—linear—to its height, and this is called a linear PCM system (LPCM). The digital audio stored on your audio CD is 16-bit LPCM digital audio. When using a Pro Audio sound card and recording 16-bit digital audio to disk, you are also saving the audio as LPCM digital audio.

Adaptive Differential Pulse Code Modulation

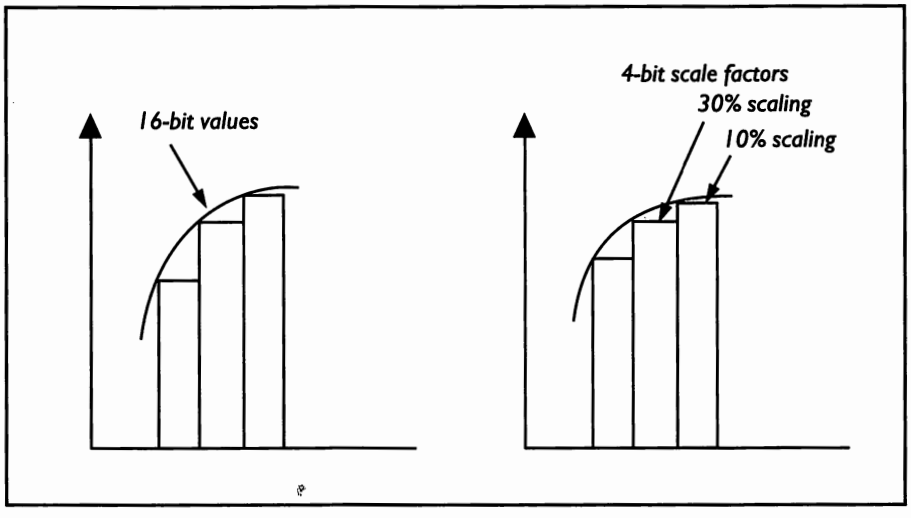
A sophisticated variation of PCM, called adaptive differential pulse code modulation (ADPCM), stores sound with fewer bits per sample than LPCM and is commonly used for audio compression. ADPCM tightly squeezes digital audio while retaining good fidelity of sound following decompression.

Figure 5-4 compares LPCM and ADPCM samples. The left half of Figure 5-4 shows that with LPCM the audio is captured by recording the amplitude of the waveform at each point of time. With 8-bit samples, the amplitude can be recorded to an accuracy of approximately 1 part in 256. With 16-bit samples, preferred for high-fidelity recordings, the amplitude can be recorded to an accuracy of about 1 part in 65,536.

The trick behind ADPCM is to capture the difference from one sample to the next, rather than the actual value of each sample. You can reconstruct the waveform by starting from an initial point and plotting each change. This technique resembles the recording of a chess game. You don't need to see what the board looks like before each move, since you reconstruct the game by playing out, in a step-by-step fashion, the list of moves made by the chess pieces.

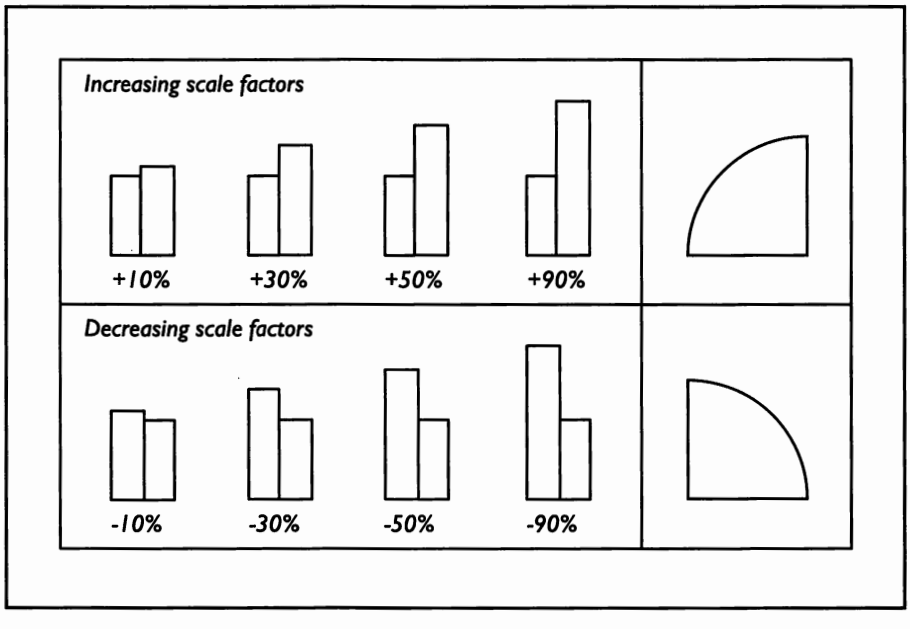
The right half of Figure 5-4 illustrates how a complex waveform is recorded by taking just 4-bit samples with ADPCM. It's surprising but true that just 4 bits, which means just 16 different values, can do a decent job in replicating a complex waveform. The ADPCM technique accomplishes this by assigning a 4-bit value that is a scale factor for that sample. The value is

FIGURE 5-4
Comparing LPCM and ADPCM samples



not the amplitude of the waveform at that point of time, it is the *scaling factor,* the amount the previous sample should be multiplied by, to arrive at the amplitude for the current sample. Figure 5-5 shows the relative amplitude of two adjacent samples, illustrating the effect of just eight scale factors. With 4-bit ADPCM there will be 16 scale factors, giving finer control over the curvature of the waveform, and with 8-bit ADPCM there can be up to 256 scale factors, clearly more than enough.

FIGURE 5-5
Scaling a digital audio sample by eight different scaling factors



Compression Speed

The latest version of Media Vision's Pocket Recorder, a Windows program that comes with the Pro Audio cards, is capable of saving and retrieving ADPCM compressed audio files. However, neither this software nor the other software programs provided by Media Vision handle real-time 16-bit compression or decompression.

Your sound card and software combination performs 16-bit audio compression "in software." This is computer lingo for saying that your computer's general-purpose CPU will have to do the compression work, since there isn't another chip, either on the sound card or on your computer's motherboard, that's available to do the job.

There are two reasons why Media Vision's recording software, such as Pocket Recorder, doesn't do real-time compression. The first reason is that many PCs today don't have the computer horsepower to handle real-time compression at the higher sample rates. The reason you can record or play back raw (uncompressed) digital audio at the top 44.1KHz rate is that the sound card has dedicated PCM circuitry that does all the work.

The second reason for not doing real-time compression in software is that the sound card industry still lacks a single standard for audio compression. While the ADPCM technique is broadly accepted, the implementations of it vary, so a sound file compressed by one software package is unlikely to be readable by a package sold by another company.

Pocket Recorder does compress 16-bit digital audio after it has already been saved in an uncompressed form to memory or to disk. With the latest version of Pocket Recorder, when you're ready to save to disk, you can select either 4:1 compression (16 bits are saved as 4 bits) or 2:1 compression (16 bits are saved as 8 bits). This compression is feasible because Pocket Recorder can save to disk at its own pace, which seems fast to us but is leisurely compared to keeping up with sound as it comes in over the microphone, line-in, or CD-ROM audio output.

Dangers of Repeated Compression and Decompression

Compression schemes can be either lossless or lossy. With *lossless compression* techniques you can compress your audio or video or other type of file, for storage or for phone line transmission, and then later expand and use it without any degradation in quality. Since audio files lack redundancy, there's little savings in file size when they are compressed with lossless techniques. As a result, audio files are typically compressed with the ADPCM *lossy compression* technique.

You should avoid repeatedly compressing and decompressing audio files since every time the audio file is compressed or decompressed, a little bit more

of the information is lost. This degradation occurs in the following fashion. *Quantization errors* occur when a sample value must be rounded. For example, if a waveform has a height of 8.53 units, but it can only have a value between 1 and 10, then it must be rounded up to 9. In this case, the quantization error is about five percent. Successive compressions and decompressions, with errors like this, can quickly ruin the quality of the sound.



NOTE: *The game-compatible (Sound Blaster-compatible) part of your sound card contains hardware for performing 8-bit audio sample ADPCM compression (it doesn't contribute to 16-bit digital audio compression). It can compress in ratios of 2:1, 3:1, and 4:1 and can handle mono decompression up to 22KHz and mono compression up to 12KHz. The circuitry provides compatibility with game software that uses compressed audio. Since 8-bit ADPCM compressed audio doesn't sound pleasing (a lot of audio quality is lost), except for special effects like a cannon shot, you're unlikely to encounter these files.*

EVOLUTION OF AUDIO: WHAT'S COMING NEXT

This section provides a snapshot of technologies likely to appear in a future generation of Media Vision sound cards: waveguide synthesis and digital signal processors.

Waveguide Synthesis

After reading the discussion in Chapter 4 on wavetable synthesis, you might wonder what could be better than wavetables, samples of real instruments. The obvious answer is the actual instrument, and the not-so-obvious answer is a computer program that simulates the instrument. This technology, which Media Vision calls waveguide synthesis, addresses the primary drawback to wavetable synthesis. Since wavetable synthesis plays digital samples of an instrument, it sounds authentic but lacks the unique expressiveness that a musician brings to each performance.

The idea behind waveguide synthesis technology is to build a computer model of the instrument and play the model in the computer, providing real instrument sound without the actual instrument. With this technology you could potentially instruct your "saxophonist" to blow a little harder or softer to match your taste in performance. This may sound pretty far-fetched, but computer-generated movie animation can already make the impossible—dinosaurs charging across the landscape—look as real as anything we actually experience.

Media Vision is working closely with John Chowning of Stanford, who was mentioned in Chapter 4 as the pioneer behind the FM synthesis technology. Media Vision intends to bring Chowning's latest technology for music synthesis to fruition in future sound cards. Media Vision will probably develop custom chips that do the calculations necessary for waveguide synthesis, since the amount of computer horsepower needed would severely tax the typical PC.

In case you've already written off this technology as nothing that might be popped into your computer anytime soon, be aware that waveguide synthesis is already in commercial use for very high-end speech synthesis equipment. This equipment can produce surprisingly natural sounding voices using computer models of the throat and the vocal chords. This effect is created by using formulas that describe the vibratory nature of similar objects, well known to science, such as the resonant pipe (for the throat) and vibrating strings (for the vocal chords).

The waveguide synthesis technique has clear parallels to MIDI music. In both cases, the audio file stores instructions on how to recreate the sound and not the sound itself. This results in very compact files for the amount of sound that can be produced and limitless expression once the basic building blocks of language (or MIDI music) are created.

Digital Signal Processing

All Media Vision sound cards record and play back digital audio. Once sound is stored as numbers in the computer, it can be easily processed (transformed). Audio special effects traditionally performed by analog hardware, such as using an echo unit to add an echo, can now be accomplished on a limited basis by software like Media Vision's Pocket Recorder. A fancy name for working with audio or video while it's in a digital form is *digital signal processing*.

There are many audio applications for digital signal processing, such as sample rate conversion, equalization (changing the relative strength of the frequency components), compression, mixing, error concealment (masking flaws), frequency decomposition (FFT for speech recognition), and waveguide synthesis for speech and music synthesis. Ideally, digital signal processing is performed by a dedicated chip called a digital signal processing chip (DSP). This is a special type of microprocessor chip designed specifically for the operations most basic to digital signal processing: addition, multiplication, and delay.

The beauty of using a DSP instead of your computer's CPU for digital signal processing is that the DSP takes over the mundane yet very computationally intensive work of digital signal processing. Your computer's CPU will then be better able to interact with you and handle other tasks. The

relationship between the CPU and the DSP is the same as the relationship between your computer's CPU and its math coprocessor. In addition, since the DSP has been optimized for digital signal processing, it tackles this task at a furious pace, far faster than a general-purpose processor like an 80386, 80486, or even a Pentium. A DSP easily performs digital signal processing functions like compression and decompression, equalization, and *reverberation* (the slight echo you hear within a building), and can do it in real-time so you can process sound as you're recording or performing.

DSP chips are still too expensive for widespread use on sound cards. Once costs come down, DSPs will make their appearance on sound cards, and audio applications will blossom with new power and flexibility.

When is a DSP Not a DSP?

Be skeptical if you encounter an inexpensive sound card that claims it has a DSP. A key characteristic of a true DSP is that it's programmable, so it can handle a variety of tasks such as real-time compression and special audio effects. If it is "dedicated" to one task only, it's not a true DSP.

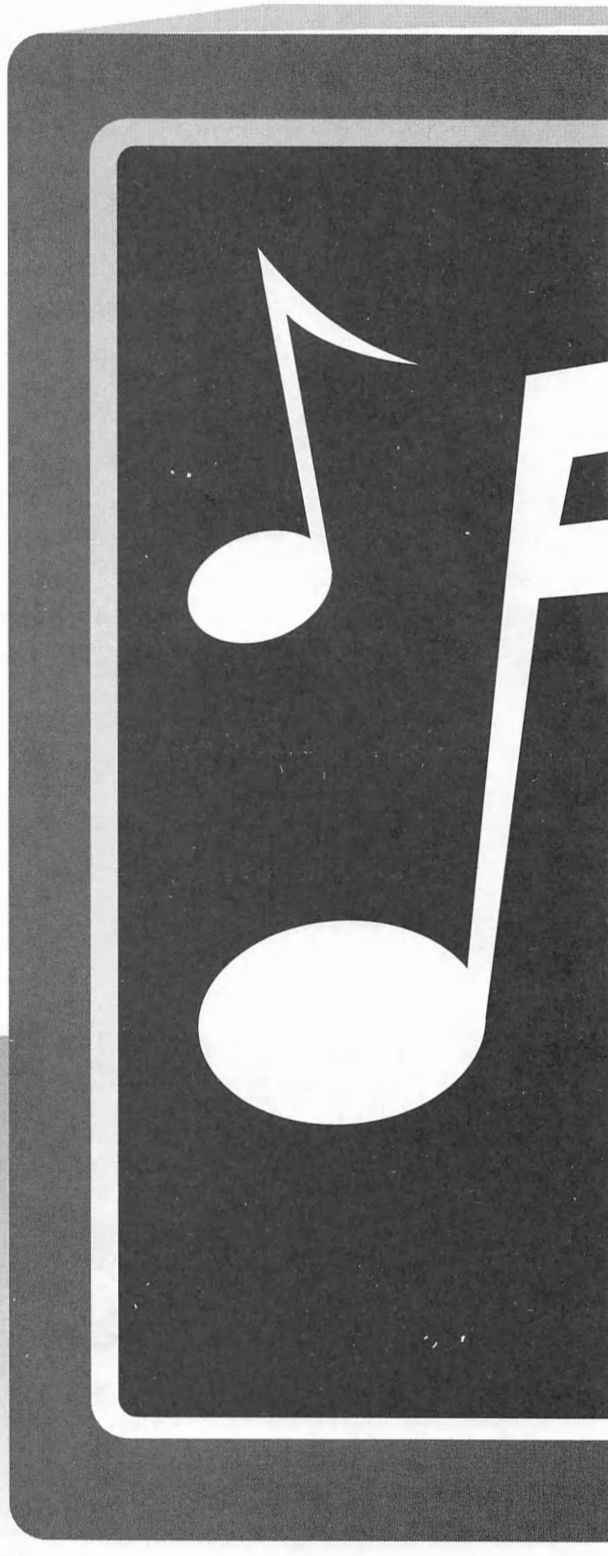
DSP Technology in the Macintosh

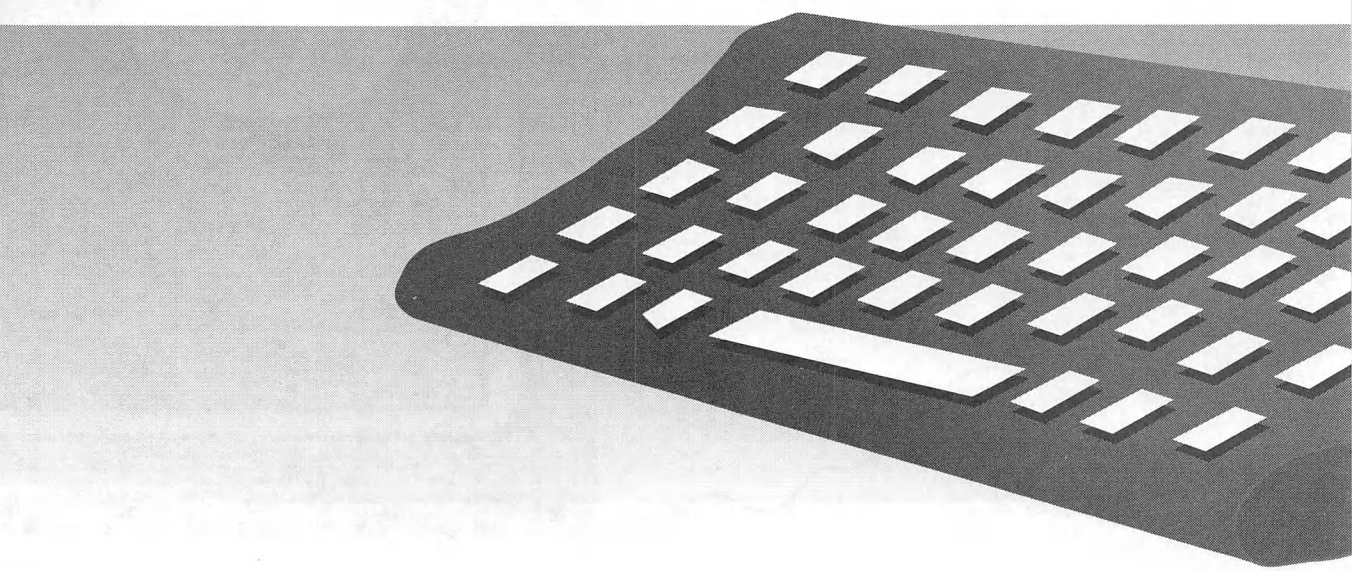
Be careful when talking to your Macintosh friends about multimedia PCs and DSPs—they may have just bought one of the new AV (audio visual) Macs. The IBM PC-compatible world has made rapid advances in sound and multimedia, yet Apple keeps raising the ante. In August, 1993, Apple rolled out their Quadra 840AV and Centris 660AV machines. These machines put motion video, stereo sound, and DSP technology into a powerful multimedia platform that doesn't require any add-in cards. The Centris 660AV has an initial base price of just $2,489. Both machines use the powerful 32-bit AT&T 3210 DSP chips to complement the 68040 CPU in the Macintosh.

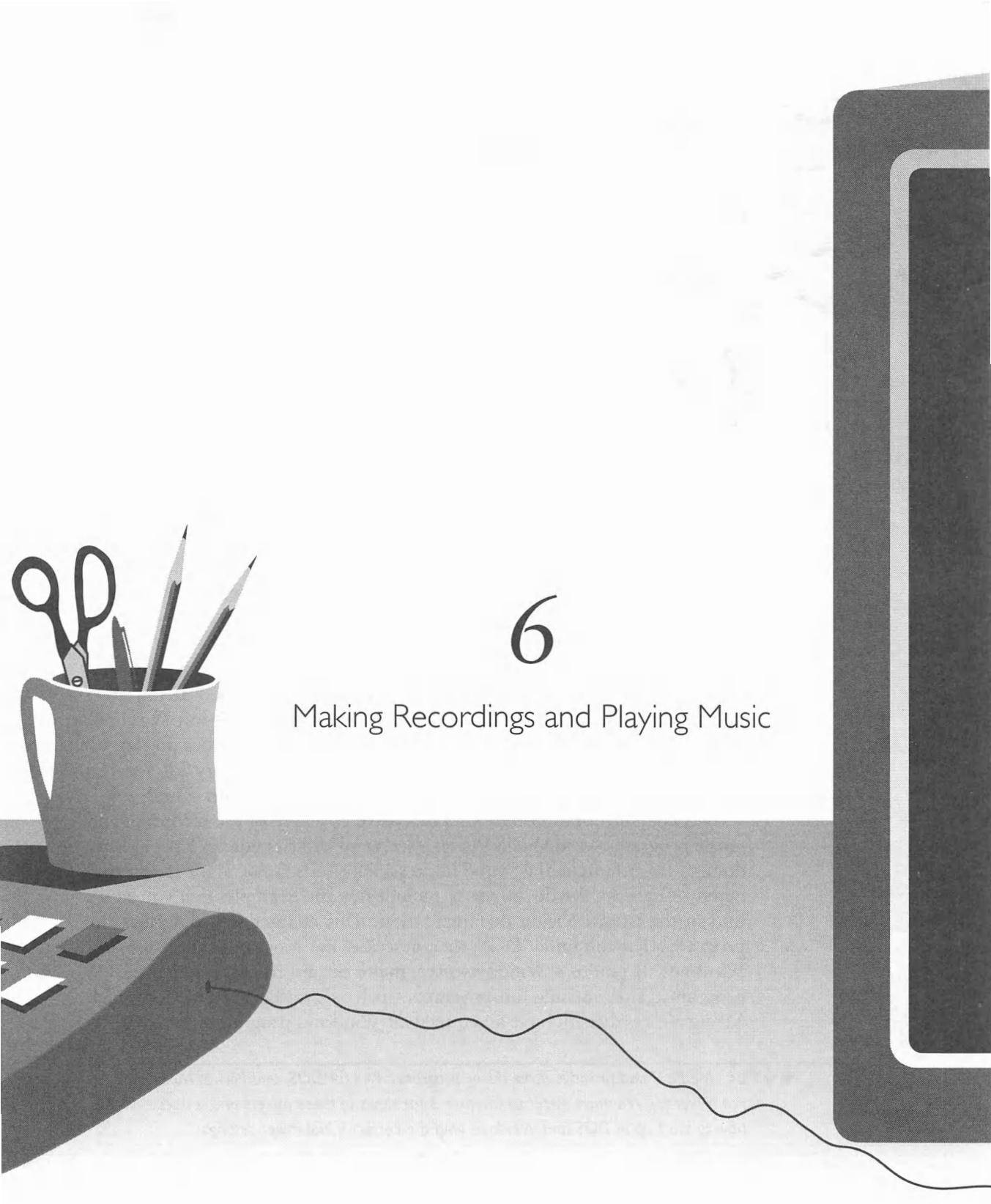
The list of software applications bundled with these computers will give you a good idea of the breadth of applications that digital signal processing can tackle. The software includes Apple's PlainTalk speech synthesizer and their Casper voice-recognition technology. These Macs also come with ApplePhone, literally a telephone on the screen with which you can make and receive phone calls as well as send and receive voicemail messages. Other bundled software includes ExperVision Inc's ExperFAX, which translates fax data to text, Video Fusion Ltd.'s Fusion-Recorder, which captures digital video, QuickKeys' OSA Component, which permits you to create speech-activated macros to automate running programs, and a video conferencing program by The Electronic Studio.

III

Making the Most of the Bundled Software

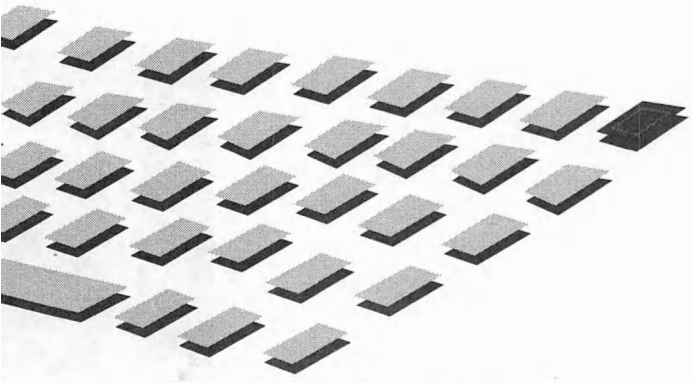






6

Making Recordings and Playing Music



MEDIA Vision provides a wealth of programs for working or simply playing with sound, including MIDI music files, digital audio Wave files, and audio CD. If you've bought a sound card from Media Vision, you will find that many of these programs and utilities, with the exception of Sound Impressions, have been automatically installed, in your Media Vision software directory. See Appendix A for a complete listing of which programs are provided with which sound card, multimedia upgrade kits, and multimedia system.

This chapter reviews these programs and offers tips on their operation. Some of the programs, such as Playfile, are DOS command-line utilities that are small, simple programs run by a single command typed at the DOS prompt. Others, such as Pocket Tools, operate under Microsoft Windows and are simple but deceptively powerful programs. One program, Sound Impressions, shipped with the PowerPak software accessory kit for Pro Audio sound cards, can do virtually anything you desire with sound.

This chapter doesn't offer comprehensive coverage of the recording and music programs—the Media Vision User's and Utilities Guides have already done so (for example, the Sound Impressions User's Guide alone is approximately 80 pages). We do, however, include tips and examples that you won't find in the Media Vision documentation. This chapter first describes the programs that run under DOS, then describes the programs that run under Windows. If you're a Windows user, make certain to check out the DOS programs. They include fun programs, such as TrakBlaster Pro, for which Media Vision doesn't have an equivalent Windows program.



NOTE: *Media Vision provides three mixer programs: PAS for DOS, and Pocket Mixer and Pro Mixer for Windows. Refer to Chapter 3 for views of these mixers and a discussion on how to start up in DOS and Windows with the correct initial mixer settings.*

DOS PROGRAMS

Whether you prefer DOS or Windows, you're certain to get a lot of value and enjoyment from the DOS programs provided by Media Vision. You've got to try TrakBlaster Pro to see how your computer can literally rock with music.

TrakBlaster Pro

TrakBlaster Pro plays pleasing music while lighting up your screen with music pyrotechnics (see Figure 6-1). TrakBlaster Pro, like other MOD (modular) players, uses MOD files containing digitized samples of real instruments and the notes to play with these instrument voices. Although the digital instrument samples are only a few hundred bytes each, the music quality is better than that of FM-synthesized instruments. MOD players typically play four instruments simultaneously.

MOD players place such a heavy computational burden on your computer's CPU that this technology is not a truly viable music synthesis technology. The advantage of FM synthesis and wavetable synthesis for

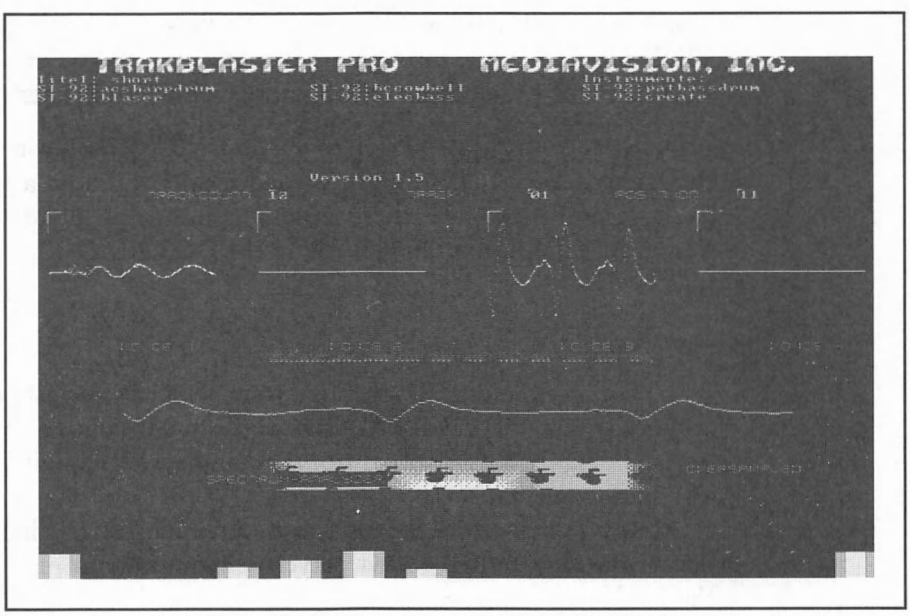


FIGURE 6-1 *TrakBlaster Pro*

music creation is that these two technologies don't require much attention from your computer's CPU, so your computer will have plenty of horsepower to do other tasks while you're listening to music. In addition, while the MOD player sounds good compared to the FM synthesizer, it pales in comparison to the audio CD quality sound of a wavetable synthesizer. The technological approach underlying MOD players and wavetable synthesizers, the synthesis of music from digital samples, is the same; however, the implementation and results are much different.



TIP: *The Media Vision Bulletin Board System (BBS), a computer you can dial into for obtaining files, program updates, and technical support by electronic mail, is a good source for more MOD files.*

Installation/Troubleshooting

The following discussions address the most frequently raised issues regarding TrakBlaster Pro: configuration, compatibility, and DMA and IRQ settings.

CONFIGURING TRAKBLASTER PRO Your PC must be fast to show off all of TrakBlaster Pro's bells and whistles, such as the oscilloscope, where music dances before your eyes. By running TBCONFIG.EXE, the configuration program, you can turn off the visual display features so your computer can dedicate all its resource to keeping up with the music.

MOD FILE COMPATIBILITY Not all MOD files work with all MOD players. MOD files have gone through many mutations, so you must check whether each batch of MOD files are compatible with TrakBlaster Pro.

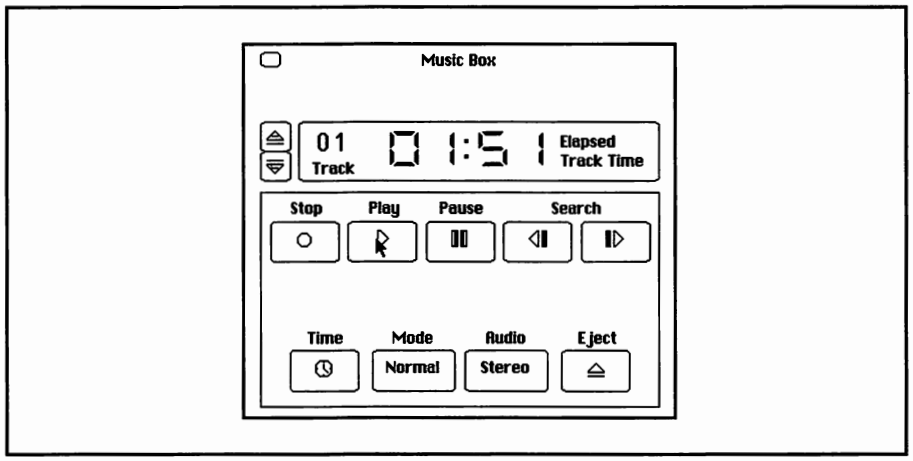
DMA AND IRQ SETTINGS Prior to version 1.05, TrakBlaster Pro didn't use the higher (16-bit) DMA and IRQ settings. If you need a newer version of TrakBlaster Pro that uses these settings, you can download it from the Media Vision BBS. Look for TBPRO.ZIP in the DOS area.

Musicbox

To hear your audio CDs through your PC speakers, just pop your favorite audio CD into the CD-ROM drive and run Musicbox. The control panel, visible in Figure 6-2, is straightforward and is well explained in your Media Vision documentation.

After you exit Musicbox, either by pressing ESC or clicking the top left corner button, the CD-ROM player will continue to play until the end of the track.

FIGURE 6-2
Musicbox



Memory-Resident Operation

A nice feature of Musicbox is that it can be loaded as a *memory-resident program*. A memory-resident program is also known as a *terminate and stay resident (TSR) program*. It's a small program that once loaded in memory allows other programs, such as your favorite word processor, to be loaded as well. With Musicbox loaded in memory you can play your favorite CD tracks while composing a letter in your word processor. By pressing a *hot key*, a special key combination, you can control Musicbox even though you're in the midst of running another program.

LOAD MUSICBOX AS TSR Type **MUSICBOX /R** then press ENTER. This loads Musicbox as a TSR with the default hot key combination of CTRL-LEFT SHIFT-TAB to invoke it. When you exit Musicbox, it disappears from the screen but is still in memory. When you're running another program, Musicbox will issue a series of descending tones, indicating that Musicbox is listening to the commands you type (until you press ESC).

PAUSE AND RESUME PLAY To pause play of your CD by Musicbox, press the hot key (CTRL-LEFTSHIFT-TAB) combination. When you hear a series of descending tones, press the SPACEBAR Press theSPACEBAR again to resume play.

REMOVE MUSICBOX FROM MEMORY You must be at the DOS prompt to remove Musicbox from memory. Press the hot key (CTRL-LEFTSHIFT-TAB) combination, release when you hear the tones, then press CTRL-X. You'll see the DOS prompt again, and the memory previously occupied by Musicbox is now available to other programs.

Playfile

PLAYFILE.EXE is a DOS command-line utility that's the fastest and easiest way to play digitized audio files with .WAV and .VOC extensions. Type **PLAYFILE**, press SPACEBAR and type the file name. Since Playfile can play a sound file in a single command line, you can include it in your AUTOEXEC.BAT file to add your personal greeting recorded with Recfile or Pocket Recorder, two of Media Vision's recording utilities, when you boot your computer. If you type **PLAYFILE** and then press ENTER, you'll see the available command switches. If your Utilities Guide from Media Vision doesn't describe these switch settings, look in the Question and Answer section of your User's Guide.



TIP: *The disk that accompanies this book has recording and playback utilities that do everything that Playfile and Recfile do, but better. They include advanced features such as audio compression, visual display of your recording progress, and the ability to play Microsoft Sound Bite files.*

Recfile

RECFILE.EXE is the DOS command-line utility that complements PLAYFILE.EXE. It's ideal for making a quick recording from the microphone. It's also a fun tool for experimenting with digital audio, because you can control the most important digital audio parameters: sample rate, filter setting, and sample size (16-bits or the more economical 8-bits). If you type **RECFILE** and then press ENTER, you'll see the available command switches. If your Utilities Guide from Media Vision doesn't describe these switch settings, look in the Question and Answer section of your User's Guide.

When you specify the filename, you should use a .WAV file extension to force creation of a Microsoft Wave file rather than letting the utility create, by default, a Voice (.VOC) file. If you type **RECFILE MYVOICE** at the DOS prompt, for example, you'll record a Voice (.VOC) file. On the other hand, if you type **RECFILE MYVOICE.WAV** Recfile will create a Wave (.WAV) file instead. A Wave file is more useful because it can be used by both the DOS Playfile utility as well as nearly every Microsoft Windows program that handles digital audio. When you create a Wave file, be aware that only the following sample rates will be recognized as valid by all sound programs: 44.1KHz, 22.05KHz, and 11.025KHz.

INSTALLATION/TROUBLESHOOTING Recfile has V*nnn* and V+*nnn* switches for voice-activated recording, but this feature doesn't work reliably in the latest versions of Recfile (such as versions 2.06 and 2.08). You can download

an older version from the Media Vision BBS that does work correctly. Look for PAS16D1.ZIP. Inside this zip file is PROGRAMS.LZH, which contains a fully functioning version of the RECFILE.EXE program.

If you let Recfile create a Voice (.VOC) file, Playfile will give you an error message when it's played. You can avoid this error condition if you stick with Wave (.WAV) files.

TPCM

The TPCM utility is a powerful digital audio play-and-record utility that's provided on the diskette accompanying this book. It combines nearly all the features of Playfile and Recfile into a single program. In addition, TPCM has valuable features that are not available with Playfile or Recfile. TPCM can do 2:1, 3:1 or 4:1 compression as it saves to your hard disk. On a fast PC, it can do 4:1 compression at an amazing 44,100 samples per second. Naturally it can play compressed digital audio files as well as record them. TPCM can also do voice-activated recording, recording only when the sound exceeds a threshold in volume.

The TPCM utility is so rich with features that Appendix G, "Digital Audio Utility Programs," is provided as a tutorial on how to use TPCM and a group of related utility programs. The CmpWav utility compresses and decompresses 16-bit digital audio Wave files. PCMFun, in conjunction with LoadPCM, does fun things with sound. You can load .WAV files into extended memory and play them with keystrokes or batch file commands.



TIP: *TPCM can play Microsoft Sound Bits. Sound Bits are small compressed digital audio sound files with a .WAV extension (even though they're not the usual uncompressed Wave files) that can be attached to Microsoft Windows events, such as a Window Maximize or File Save. If you encounter Wave files that can't be played by your other sound programs, such as Pocket Recorder and Playfile, try playing them with TPCM.*

MICROSOFT WINDOWS PROGRAMS

Media Vision provides several easy-to-use sound programs in a series called Pocket Tools that includes Pocket Mixer, Pocket Recorder, and Pocket CD. In addition, PowerPak, which comes standard with Pro AudioStudio, includes Sound Impressions, software for serious audio soundtrack production.

Pocket CD

Pocket CD is the perfect utility program for playing audio CDs in your CD-ROM drive while you're working away at your PC. You can select a track, play all tracks in sequence, or use the shuffle feature to play tracks randomly. Figure 6-3 shows the straightforward user interface.

Installation/Troubleshooting

The software engineers designed Pocket CD to be a small program that loads fast and doesn't take up much memory. One of the trade-offs in doing so is that the program isn't very smart about error situations. If you see a cryptic error message in a dialog box, don't panic. The solution is probably something as simple as not having an audio CD in the CD-ROM drive (perhaps you've inserted a CD-ROM disc instead). You'll also see an error message if you try to start Pocket CD twice by double-clicking the icon. Press ALT-TAB or CTRL-ESC to switch to the copy already running.

Pocket Recorder

Pocket Recorder is pure pleasure. Record your favorite audio CD track, your voice, or even the bark of your dog. Once you've captured it, you'll have unlimited fun playing with special effects like echo, reverberation, and changing the speed so the voice will sound like Donald Duck. Pocket Recorder is also the perfect tool for creating voice-overs for multimedia presentations and training programs. Figure 6-4 shows the main Pocket Recorder screen after a recording has been made.

When you select New from the File menu to create a new recording, the Record Parameters dialog box appears (see Figure 6-5) so you can decide whether to record in stereo or mono and at what sample rate. Note that on the far left, the audio meter (sometimes called a VU—for volume unit-meter)

FIGURE 6-3

Pocket CD

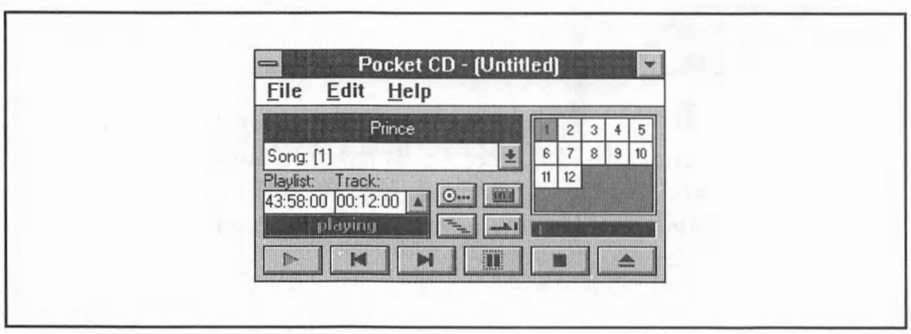
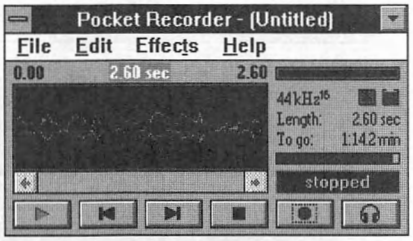
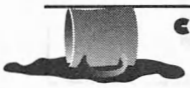


FIGURE 6-4

Pocket Recorder



shows you that the mixer is feeding sound to Pocket Recorder. By clicking the Mixer button at the bottom left, you can bring up the mixer to select your audio sources and fine-tune the mix.



CAUTION: *With the latest version of Pocket Recorder you can compress your file when you save to disk. The file then automatically decompresses when you reload it. If you have a particularly valuable sound sample, it's a good idea to save it without compression. Every time a file is compressed or decompressed, its quality is diminished. See the discussion on ADPCM in Chapter 5 for more details.*

Sound Impressions

Sound Impressions is a complete multimedia sound recording and production setup. Going from Pocket Tools to Sound Impressions is like moving from the cockpit of a two-seat Cessna to a Boeing 747—the number of buttons, slides, and gadgets to play with is dizzying. Figure 6-6 shows Sound Impressions in its full glory, with five panels stacked. The panels, from top to bottom, are: the title panel, with buttons to select which of the other components and screens to display; the mixer panel; the digital audio recorder; the MIDI player; and the audio CD player.

FIGURE 6-5

Record Parameters dialog box for Pocket Recorder

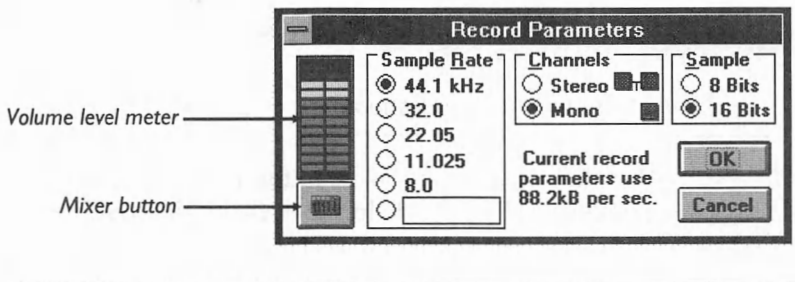
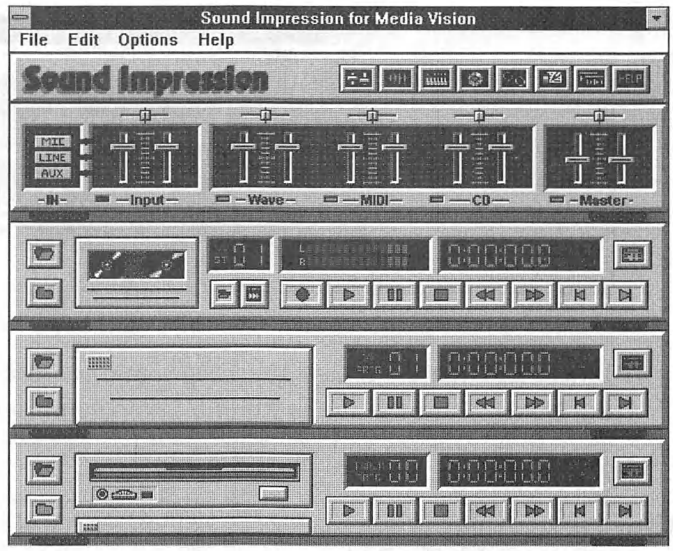


FIGURE 6-6

Sound Impressions: all panels



The program is a bit overwhelming at first, so you should select a single component, hide the others, and stick with that component until you're ready to move to the next. To hide a component, or display it after it has been hidden, click on that component's button in the button bar at the top of Sound Impressions.

To learn what the controls and buttons do, place your mouse pointer on the object of interest, then click and hold the right mouse button. An explanatory caption will appear. Fortunately, the help system that accompanies this program is first-class.

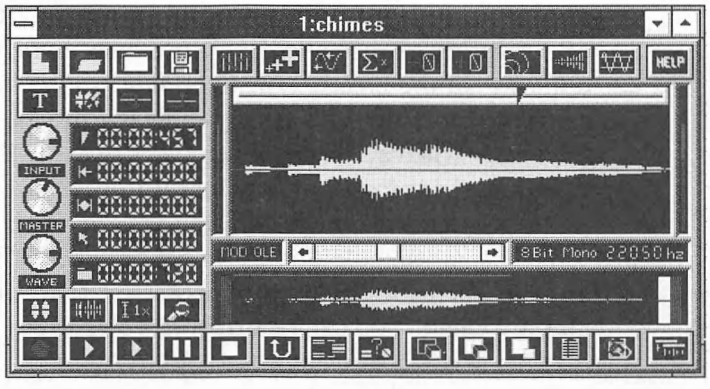
Wave Editor

One of the most powerful features of Sound Impressions is the Wave Editor which can create many special effects and perform special processing typically found only on a professional digital audio workstation. The Wave Editor screen is shown in Figure 6-7.

Installation/Troubleshooting

For help in installation, go to the Windows File Manager and double-click the AUDIOTEC.HLP help file in the \AUDIOSIM directory.

FIGURE 6-7
Sound Impressons: Wave Editor



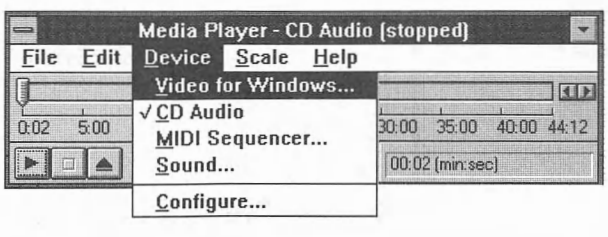
Windows Media Player

Windows Media Player is provided by Microsoft with every copy of Microsoft Windows, and it is documented in your Microsoft Windows User's Guide. Although not provided by Media Vision, Media Player is mentioned here because it's a handy software program that nicely complements Pocket Tools. As you can see in Figure 6-8, this single utility is special in that it can play many types of sound, including digital audio files (.WAV files), MIDI files (.MID and .RMI), audio CD tracks, and even Microsoft interleaved audio/video (.AVI) files.

Advanced Applications with OLE

The Microsoft Windows 3.1 environment offers a powerful feature called Object Linking and Embedding (OLE). With OLE you can embed an object,

FIGURE 6-8
Microsoft Media Player



such as a sound file or picture, into another object, such as a word processing document. An even more powerful feature of OLE is that you can link an object rather than embed it. When you *embed* an object, you create a duplicate of the object. When you *link*, you're inserting just the name and address of your object, so there's only one original copy in existence—pretty important when audio and video files can easily exceed a million bytes each. Programs that provide objects for OLE are referred to as *OLE servers*, while programs that can accept OLE objects are referred to as *OLE clients*.

Here's an example of OLE in action. Pocket Recorder is an OLE server and the Microsoft Write word processor, found in the Accessories group, is an OLE client. You can record your voice with Pocket Recorder and insert it into a Write document.

You're probably still wondering what the practical uses are for this nifty feature. At Media Vision, it's common to get an electronic mail message that contains no text—just an OLE embedded sound file that you listen to! OLE is also a powerful tool for creating compound documents that include sound, pictures, and even video.

OLE Tutorial

Let's try an OLE example. Go to the Accessories window and double-click on Write to bring up this word processor. You should see a window similar to the one shown in Figure 6-9.

Add a little text, then select Insert Object from the Edit menu. Select Pocket Recorder Wave from the list of object types (Media Vision's Quick Start installation program automatically registered this with Windows when your sound card was installed). Now you'll see the Pocket Recorder appear with the title bar "Pocket Recorder in Write." Make a one- or two-second recording of your voice. Select the Play button to ensure the recording is

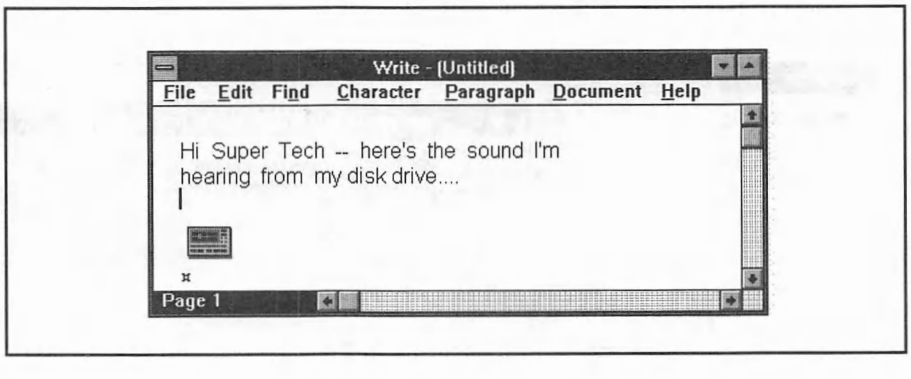


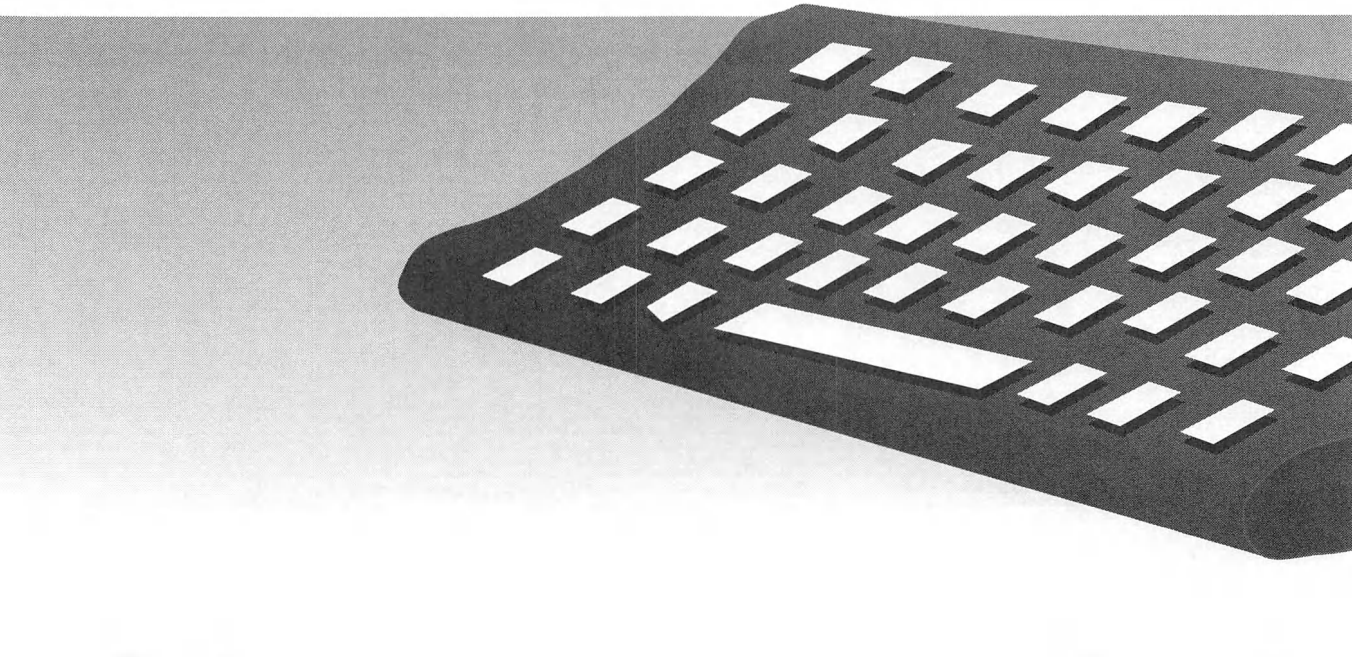
FIGURE 6-9 *OLE with Pocket Recorder and Write*

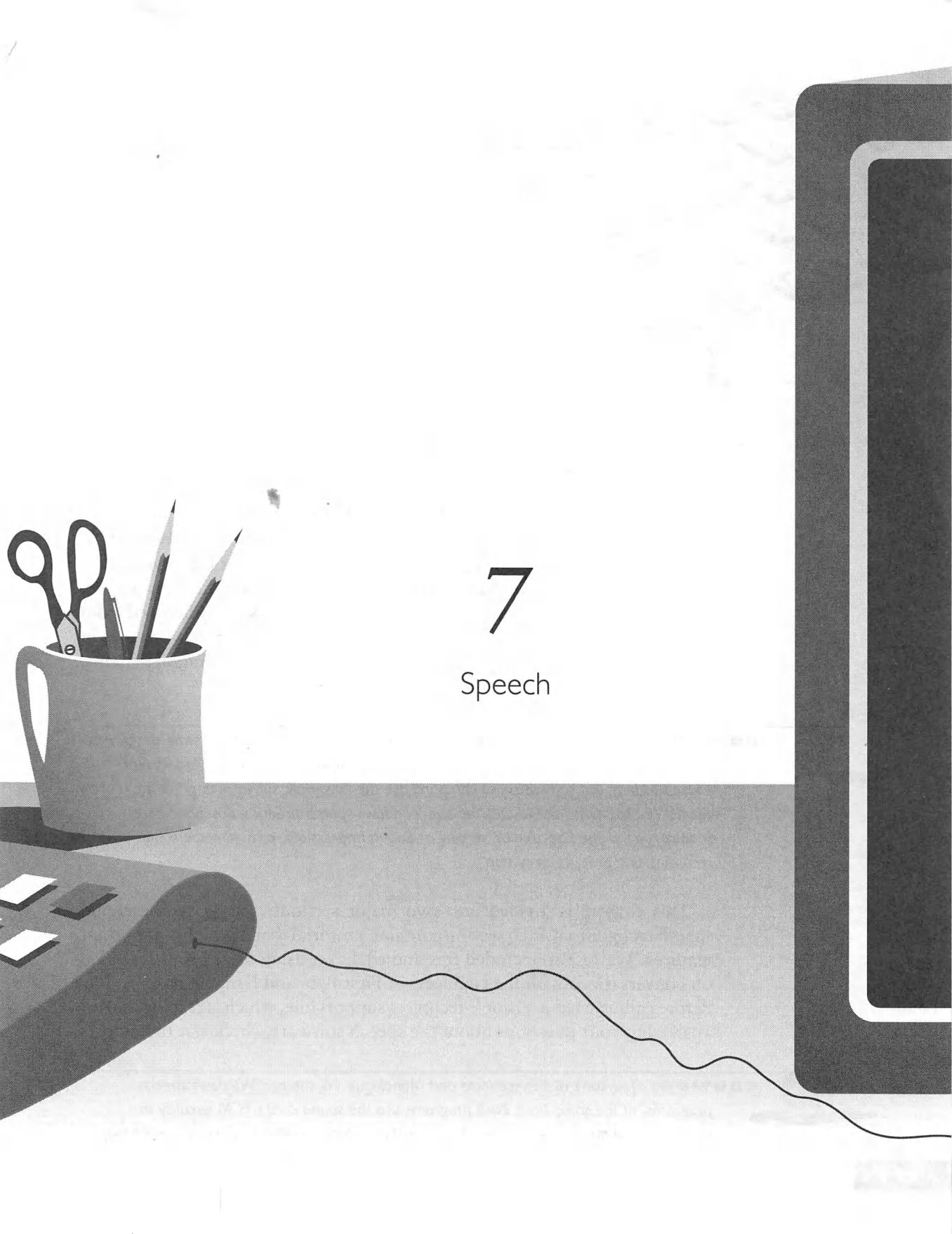
okay. Next, select Return to Write from the File menu. Select yes, and you'll see a colorful icon that's a place marker for a Pocket Recorder sound file. Double-click the icon and you'll hear your voice.

If you save the file and look for it with your File Manager (it's probably in your Windows directory), you can tell from the file size that your voice has been embedded in this file. Since the sound is embedded, you can mail the Write document across the network. If the recipient has Pocket Recorder in their computer, they can listen to your voice.

ROAD MAP TO MORE SOUND PROGRAMS

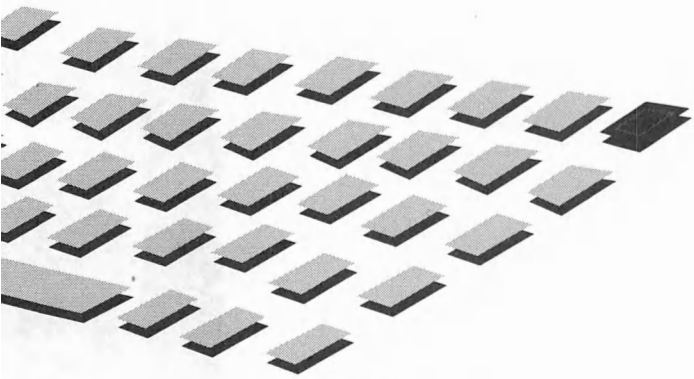
If you'd like to experiment with utility programs for digital audio, be sure to review Appendix G, "Digital Audio Utility Programs." These utilities are found on the disk that accompanies this book.





7

Speech



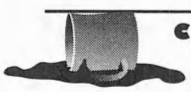
THE distinction between science fiction and science fact for the desktop computer has been irrevocably blurred. It's now completely practical to communicate with your PC through speech. Most Pro Audio sound cards are accompanied by a program that speaks text out loud, called a *text-to-speech synthesizer* or *speech synthesizer*. In addition, many Pro Audio sound cards come with *speech recognition* software that responds to spoken words such as "file open," as if you were typing at the keyboard.

At this time, Media Vision offers two speech-synthesizer programs, Monologue for DOS and Monologue 16 for Windows, both licensed from First Byte. The speech recognition software, ExecuVoice, which operates in the Microsoft Windows environment only, is licensed from Dragon Systems, Inc.



NOTE: *If you bought Pro AudioStudio 16, you have the Windows speech software described in this chapter. If you have Pro AudioSpectrum 16 or one of the multimedia kits that doesn't include this software, you can purchase the PowerPak software upgrade from Media Vision. PowerPak includes the two Windows speech products described here, Monologue 16 and ExecuVoice, as well as Sound Impressions, a multimedia sound recording and production system.*

This chapter is divided into two major sections: speech synthesis and speech recognition. Each section contains a tutorial that highlights important features. We've also included tips and tricks on using these products based on conversations with the engineers at First Byte and Dragon Systems, Inc. Before calling Media Vision's technical support line, which is responsible for answering your questions about the speech software, check out these tips.



CAUTION: *You can't use ExecuVoice and Monologue 16, the two Windows speech programs, at the same time. Both programs use the sound card's PCM circuitry to process digital audio, and the circuitry can either record (needed by ExecuVoice) or play*

back (needed by Monologue 16), but not both at the same time. You won't do any damage loading both, but you'll see an error message sooner or later and probably neither program will work.

SPEECH SYNTHESIS

Speech synthesis is not just fun, it's a great productivity tool. Instead of growing bleary-eyed trying to proof your computer input against the original words or numbers on paper, you can have the computer read out loud to you. Depending on which sound card you've purchased, you received either Monologue for DOS or Monologue 16 for Windows. We'll refer to them collectively as "Monologue."

About Monologue

The English language is a challenging one for speech synthesis. English is a blend of many languages, resulting in inconsistent spelling and pronunciation. Because there are so many words in a language, it's not feasible to include the *phonetic value* (the pronunciation) for every word. Monologue economizes by using a *rule-based* system for pronunciation. For example, one hypothetical rule is to pronounce the "y" before a vowel like the "y" in "you" or "yarn," and to pronounce the "y" after a consonant like "i," as in "by" or "sky."

Because English is so irregular, Monologue also uses an *exception dictionary,* a lookup list of known exceptions, to override the rules. Both versions of Monologue allow you to add exceptions to this dictionary. You type the word as it is spelled, then you type your best guess at how it should sound. For example, the word "caveat" is pronounced "cave-at" by Monologue. If you enter "cahviat" as the phonetic value, Monologue will do a much better job pronouncing the word when it's next encountered.



NOTE: *There is one caveat to adding "caveat" to the dictionary. Early versions of Monologue didn't save changes to the dictionary. If you are certain you've encountered this problem, contact Media Vision customer support to arrange for a replacement disk.*

Monologue is optimized for the English language, thus it cannot be used for other languages, such as Italian and French, due to their difference in *phonemes,* the sound building blocks of a spoken language. Table 7-1 lists the symbols for the phonemes spoken by Monologue, both the DOS and Windows versions. To the right of each symbol is a common English word

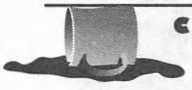
that illustrates, with the italicized letters in that word, the sound for that phoneme. For example, the first entry in the table is the phoneme whose symbol is AA. This is the phoneme for the "o" sound as in "cot." When working with Monologue's exception dictionary, you must type both the proper spelling of the word as well as how to say it. Refer to the samples in the phoneme table for ideas on how to spell a word phonetically.

Monologue's biggest problem area is acronyms and abbreviations. It's been educated at the factory to pronounce "Ave." as "avenue," but it doesn't have a clue how to pronounce "CA" when encountered in an envelope address. Instead of pronouncing "CA" as "California," it says the letter "C" followed by "A." Foreign place names prove to be the second biggest problem. There are too many to enter into the dictionary, which becomes a problem when a foreign name has been absorbed into English. For example, San Jose isn't found in the exception dictionary even though it's a very common Spanish name and one of the largest cities in California. Try using "San Jose" when you're experimenting with the dictionary. Monologue butchers its pronunciation, but you'll be pleasantly surprised at how much

Vowels		Consonants and Semivowels			
phonetic	**as in...**	**phonetic**	**as in...**	**phonetic**	**as in...**
AA	cot	UW	boot	TH	thin
AE	cat	b	bibboot	TX	stick
AH	cut	d	did	v	valve
AW	cow	DH	this, that	z	zoo
AX	about, bottom	DX	butter, city	ZH	vision, casual
AY	bite	f	fee	tSH	chin
EH	bet	g	gag	dZH	gin
ER	bird	h	he	l	light, club
EY	bake	k	curse	LX	tile, bulk
IH	bit	KX	skirt, backer	m	me
IX	rabbit, nation	p	pip	n	no
IY	beet	PX	speak	NG	song
OW	boat	s	sin	r	rock, core, car
OY	boy	SH	shin	w	we
UH	book	t	tin	y	you

TABLE 7-1 *Monologue Phonetic Codes for English Phonemes* ■

Monologue's accent improves once you add San Jose to your dictionary with the "san hozzay" phonetic value.



CAUTION: *It's best to disable screen savers when you're using speech products. If you're not typing, the computer may think you're off on a coffee break and blank the screen prematurely. It's particularly difficult to do data entry by voice when your screen goes blank. If you anticipate using Monologue to speak long passages, you should either disable the screen saver or make the onset sufficiently delayed so that Monologue can finish its oration before the screen saver kicks in.*

Monologue for DOS

Monologue for DOS actually consists of several programs: SAYFILE, MONO, and CONFIG. They are individually run from the DOS command prompt. SAYFILE speaks the contents of a text file, and MONO pronounces text visible on the screen. MONO is the more valuable of the two, so a short tutorial on how to use MONO follows. CONFIG updates the exception dictionary used by SAYFILE and MONO, customizing the behavior of Monologue for DOS.

Running Monologue for DOS Programs

You can't use Monologue from just anywhere on your hard drive. The Monologue programs are installed into a directory whose name by default is C:\MONOLOG. To use these programs from another directory on your computer, you'll need to add the Monologue directory to the PATH statement in your AUTOEXEC.BAT, located at C:\ on your hard disk.



NOTE: *ASCII files are usually created and revised with an ASCII text editor such as the MS-DOS EDIT text editor usually found in your DOS directory. If you're unfamiliar with editing the AUTOEXEC.BAT file, consult your DOS manual for precise instructions on how to carry this out.*

Tutorial: Using MONO to Read the Screen

You run Monologue's pop-up screen reader by typing **MONO** at the DOS prompt followed by pressing ENTER. Now let's read some text off the sign-on screen that Monologue's just displayed, shown in Figure 7-1.

1. Activate Monologue.

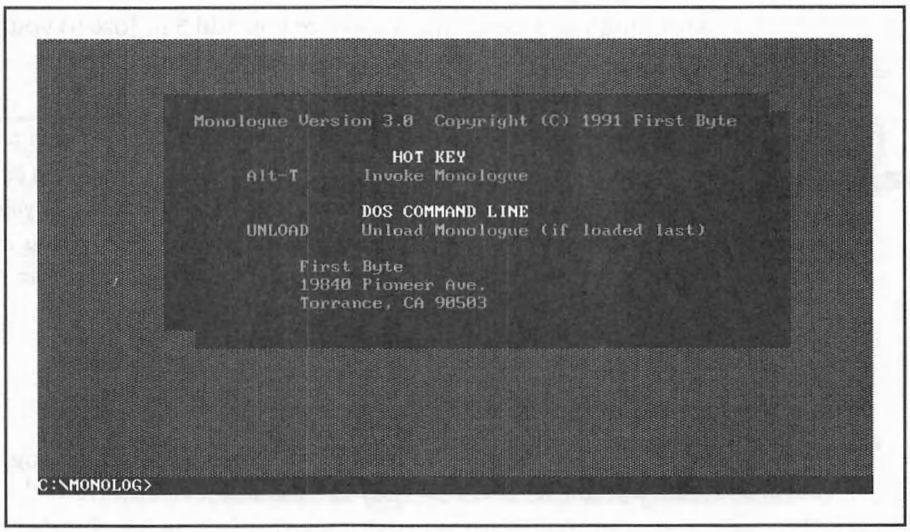


FIGURE 7-1 *The initial Monologue for DOS screen*

Press ALT-T, holding the ALT key down while you momentarily press the T key, to make Monologue wake up. You now see the Monologue cursor appear as a square block in the middle of the screen.

2. Select and Pronounce Text.

   Use your arrow keys to position the cursor on the "F" of "First Byte". Press ENTER to tell Monologue that you're now marking a block of text on the screen. Now use the RIGHT ARROW and DOWN ARROW keys to extend the highlight over the entire address area. When you next press ENTER, Monologue will pronounce the text in this area.

3. Stop Monologue.

   You can tell Monologue to stop at the end of the current line by pressing ESC. When you're done proofing the screen, press ESC and the normal blinking cursor reappears. To restart Monologue, you must press ALT-T again.



TIP: *When you're completely finished with Monologue, type* ***UNLOAD*** *and then press ENTER to remove all of Monologue from memory. It's a good idea to do this before running other terminate-and-stay-resident (TSR) programs that pop-up in a similar fashion.*

Tips on the Exception Dictionary

To access the exception dictionary type **CONFIG** at the DOS prompt, then press ENTER. There are several help screens, so press F1 while you're exploring Config to see what's available. Because neither the User's Guide nor the help screens suggest phonetic spellings for you to use, refer back to Table 7-1. This is the phoneme list for the Windows version of Monologue, but it's also applicable to the DOS version.

Tips on SAYFILE

Because Sayfile can only handle text files that contain ASCII (printable) characters, you can't use it to verbalize the contents of more complicated files, such as a WordPerfect document file, unless you arrange to save the text as an ASCII file. Check your word processor's documentation to learn how to do this.

The Monologue User's Guide indicates that in a single step you can load Sayfile and select the text file to read. You should be able to do this by typing **SAYFILE** followed by the text filename on the same line. This works only on the more recently shipped versions of Monologue. If your version of Sayfile doesn't recognize a text filename typed on the same line, you can edit the SAYFILE.BAT file to make it do so. Use a text editor such as Edit to change the line that contains "SayF" to "SayF %1%" instead.



NOTE: *A commonly asked question about Monologue is how to change the gender of the voice from male to female. Unfortunately, the current version of Monologue can't do this. First Byte has stated their intention to provide this feature in the future.*

Monologue 16 for Windows

Monologue 16 for Windows can read text from either the Windows clipboard or from Microsoft Excel spreadsheet cells visible on the screen. What's nice about reading from the clipboard is that you can use Monologue 16 with any Windows software program. Simply mark a region of text, select Copy from the Edit menu, and it's in the clipboard.

Tutorial: Reading a Write Document Out Loud

Because everyone has Write, a simple word processor that comes with Windows, this example illustrates reading a Write document.

1. Launching the Write Program.

   Use the Windows Program Manager to launch the Write program from the Accessories group. Next, load a document file that comes with Windows. Select Open from the File menu and then choose README.WRI from the list. You should see a document with the following (or very similar) title: More Information About Microsoft Windows Version 3.1.

2. Selecting Text to Read.

   Select the title and first two paragraphs using either the mouse or keyboard. Now copy this text to the Windows Clipboard (the temporary storage spot for exchanging information between programs) by selecting Copy from the Edit menu.

3. Starting Monologue 16.

   If you haven't already started Monologue 16, switch to the Program Manager and double-click its icon in the program group that contains your Media Vision software. If you've already started Monologue 16, switch to the Monologue window by repeatedly pressing ALT-TAB until it appears. If Monologue's Clipboard Mode button hasn't already been selected, click it now. This tells Monologue to read from the Clipboard. Now click OK to minimize Monologue to an icon.

4. Commanding Monologue 16 to Talk.

   Right-click the Monologue 16 icon to command it to speak. Right-click it again—be careful to do this once only—to command it to stop. Monologue 16 stops at the end of the next sentence.

Tips and Tricks

The User's Guide doesn't accurately document the version of Monologue 16 that is shipped by Media Vision, but the following sections explain the discrepancies and work around the irritations.

OMISSIONS FROM THE MANUAL The manual forgot to address the most important question—how to make Monologue 16 stop talking. You start Monologue 16 by clicking the right mouse button over the Monologue 16 Windows icon, and you stop it by repeating that step.

Another caveat not in the manual is that you must avoid reading from a clipboard that's been completely filled with text. Admittedly this takes a lot of text, about 64K bytes (about 32 pages of double-spaced text), but if you

read from a full clipboard, Monologue 16 will freeze and you'll have to terminate the task by rebooting.

KEEPING THE MONOLOGUE 16 ICON VISIBLE The Monologue 16 User's Guide includes a note on how to resize your Windows, but it's easy to be confused on this point. In order to make Monologue 16 convenient to use, the icon must appear on the screen at all times. The icon is necessary because you must right-click on it to make Monologue 16 pronounce the text. This important step is complicated by the fact that when you bring up a program, it often covers the full screen, hiding the Monologue 16 icon.

To access the Monologue 16 icon, you can use the Windows task-switching keys, ALT-TAB, to make Monologue 16 appear on top. Unfortunately, the next time you select text to read, the icon disappears again. You can solve the problem by reducing the size of your application window so that the Monologue 16 icon is safely tucked away outside the window. You can see in Figure 7-2 how the Microsoft Word window has been reduced slightly in size so that the icon appears outside the window, at the bottom left corner of the screen.

EXCEPTION DICTIONARY The first complaint about the exception dictionary has to do with accessing on-line help from Dictionary Manager, the program that opens the dictionary for you. Don't doubt your sanity if you try to access on-line help and don't get any—there isn't a help file. A bigger complaint is how confusing the manual is about the various dictionaries. The master copy

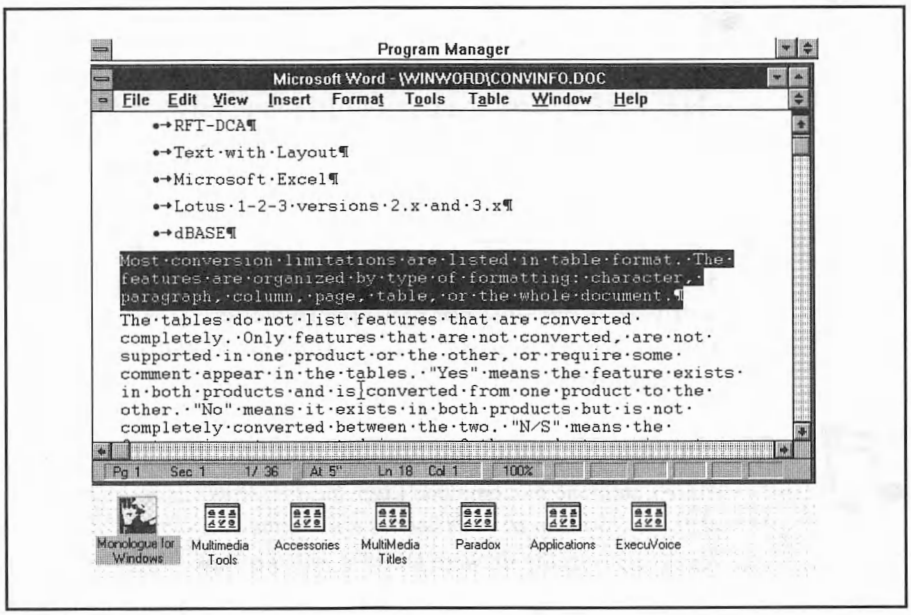


FIGURE 7-2 *The Monologue 16 icon below an application window*

of the kernel dictionary (called "kernel" because it's the kernel from which all other dictionaries are built) is FB_DEFLT.DOC, not KERNEL.DIC as stated in the manual (KERNEL.DIC doesn't exist). You create your own personal dictionary by opening FB_DEFLT.DIC and then saving a copy of the dictionary under another name (most likely your own). You then select that dictionary to be your active dictionary. In a nice touch, the Dictionary Manager protects you from hurting yourself by accidentally overwriting FB_DEFLT.DIC.

The exception dictionary has codes for special effects such as pitch changes and shortening or lengthening of phonemes. For the most part the effort involved isn't matched by the payoff, although in one situation it's worth adding a special code. Short words, those with four letters or less, are typically pronounced a little too fast, and you can add the Sn code to slow these down a bit.

MONOLOGUE 16 DLL Probably only the most techie of the techies tried the DLL speech example provided in the manual. Unfortunately, the SPEECH.DLL file required by the example isn't provided with Monologue 16. If you want to try Monologue 16's DLL interface, which gives other Windows programs access to Monologue 16's speech engine, contact Media Vision technical support. Ask for the SB_SPEECH.DLL file and change the example code to reference SB_SPEECH.DLL instead of SPEECH.DLL.

SPEECH RECOGNITION

ExecuVoice, which is part of the Pro Audio PowerPak software that ships with the Pro AudioStudio 16 sound cards and is available as a software upgrade for Pro AudioSpectrum 16 owners, is provided by Media Vision to demonstrate the power of speech recognition software for controlling your computer. Speech recognition software falls into two general categories: command and control, and machine dictation. *Command and control* software responds to your spoken commands by feeding keystrokes to your software programs. For example the letter "y" may be typed in response to the spoken command "yes." *Machine dictation* transcribes speech into written text.



TIP: *The disk that accompanies this book contains a working demonstration version of In^3 Voice Command by Command Corp. Inc. that works under Windows 3.1. To experience speech recognition all you'll need is a microphone and this program. See Appendix F for more details on the software provided with this book.*

ExecuVoice and similar programs are designed to reduce dependence on the keyboard, not to replace it entirely. Given the severity of carpal tunnel syndrome and other repetitive stress injuries among white-collar workers today, a product like ExecuVoice can make the difference between pleasure and pain.



NOTE: *When you are working within an application, ExecuVoice offers you 32 standard commands that are accessible from all applications, as well as 32 commands specific to that application program. For example, when you use Media Vision's Pocket CD application, CLOSE is one of the 32 commands available to all applications, while SELECT CD is only available to Pocket CD. Because ExecuVoice doesn't allow you to add commands, you are effectively limited to the control of applications whose use has already been anticipated.*

Higher-end speech recognition software, costing many thousands of dollars, can handle dictation or completely replace the keyboard in controlling your computer. Although the driving force for this type of software is commercial applications, this technology is proving to be a great boon to the daily life of people who are mobility impaired. With speech recognition software, a physically challenged individual can dial the telephone and receive calls, create documents and letters, and print or fax them, all under voice control.

Speech recognition software is especially handy if you don't like to use a mouse. Modern programs are designed with a graphical user interface, favoring the use of a mouse over the keyboard. If you don't use a mouse, due to personal preference or a motor-control disability, you'll have to navigate through a stack of menus before locating the command that's equivalent to a single button click. Command and control speech recognition software has the potential to wind its way through dozens, even hundreds of steps, in response to a short verbal command.

A serious problem for speech recognition products is background noise. The human brain is able to tune into a single conversation in the midst of many side conversations, but your speech software isn't as talented. With this concern in mind, Media Vision selected a microphone with good directional properties. If positioned correctly, it'll do an excellent job of picking up your voice and ignoring background sounds.

The Technology of Speech Recognition

All speech-recognition software operates in a similar fashion, matching the incoming sound against *templates*, which characterize every word and *connected-word group* (for example, "bring up") in its dictionary of com-

mands. Recognition accuracy can be improved through the process of *training*: the word or word groups are pronounced repeatedly, customizing the template to match that speaker's voice.

The details of this technology, what information is captured in templates and how it's matched against incoming sounds, are kept secret by companies. However, the basic principles are well established. The general approach identifies the unique characteristics of each utterance, based on exhaustive samples taken from native speakers. The foremost characteristic is the relative strength of frequency components. Figure 7-3 shows a smoothed plot of these components representing an average adult male speaking the "eh" sound, one of the most basic and simple vowels in English. You can see the *formant* frequencies, the peaks which reveal the frequencies of greatest strength.

Many speech-recognition products, including ExecuVoice, are speaker independent, meaning that you don't have to train it for your voice for it to work. The speech-recognition software supplier created templates by taking samples from many native speakers, analyzing them, and constructing a group norm used as a model for speech recognition. All vowels and some consonants have formant patterns like that shown in Figure 7-3, and the template for a word or connected-word group may have dozens of such formants. Because most of the frequency components of speech are relatively low in frequency, speech recognition software can simplify its processing by working only within a 5KHz or so bandwidth, a mere quarter of the range of our hearing.

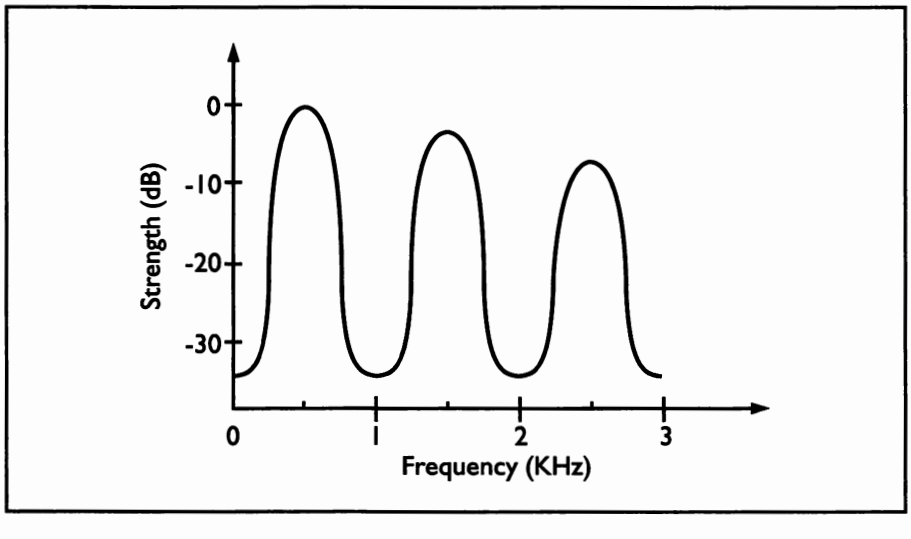


FIGURE 7-3 *Formant frequencies for a male voice speaking a simple vowel*

ExecuVoice

ExecuVoice software works very smoothly. Although you can train the software for your own voice, it works remarkably well with no training whatsoever because it's speaker independent. ExecuVoice has been set up with the most frequently used commands for Media Vision's Pocket Mixer and Pocket CD applications, as well as programs in the Microsoft Windows Accessories group: Media Player, Write, Clock, Notepad, Terminal, Cardfile, Calendar, and Calculator. In addition, ExecuVoice contains commands for operating the Voicebar, the control panel for ExecuVoice, as well as the Windows Program Manager, File Manager, and Help system. Altogether this comprises about 250 word and connected-word groups.



NOTE: *You'll notice a delay between when you speak a command and when ExecuVoice executes it, unless you're running ExecuVoice on a 486 33MHz or faster computer.*

Accross the bottom of Figure 7-4, you can see the Voicebar, which is the ExecuVoice control panel that remains on top of your other windows. The active word list, which shows the words available for the currently active window (the Clock), is shown on the right. The active word list can be alternately displayed and hidden by clicking the book button on the Voicebar.

ExecuVoice is ideal for navigating around your Windows environment. For example, to switch to the Notepad accessory, just say "Bring up Notepad," and a moment later the Notepad appears. Then say "Bring up Clock" to make the Clock application appear and to switch focus to it. Some other very useful commands are CLOSE, HELP, YES, NO, CANCEL, and especially CLEAR DESKTOP, which minimizes all your windows so you can see what's on that cluttered desktop.

The drawback to ExecuVoice is that you can't add commands to its vocabulary. You're restricted to a preprogrammed set of command sequences, such as FILE OPEN and DOWN. Although you cannot add new command sequences, you can train each of the existing commands, meaning that you can choose the spoken word or connected-word group that launches these commands. For example, you can train ExecuVoice to type "N," one of the built-in commands, when you say "nyet," the Russian word for no.

Although you cannot add commands to ExecuVoice, you can add up to 32 application icons (such as the icon for Paradox) to the ExecuVoice Program group, and train ExecuVoice to launch these applications under voice control. You can't add new commands to the active word list for these user-added applications, but you have 32 standard commands, like HELP and CLOSE, that are available to all applications, as well as a set of generic

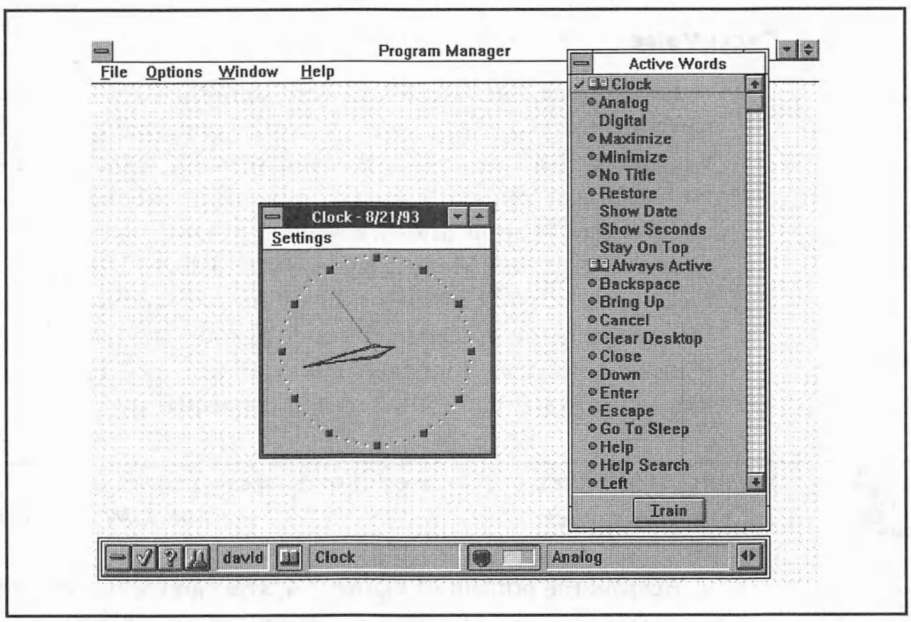


FIGURE 7-4
The Voicebar with its active word list displayed

commands, such as EDIT CUT, EDIT PASTE, FILE OPEN, and FILE PRINT, that appear only for user-added applications.



NOTE: *ExecuVoice's templates are a composite of both "high-" and "low-pitch" voices, so it can recognize both male and female voices without training. Some men speak at a relatively high pitch and some women speak at a relatively low pitch, so it's more accurate to call these "high" and "low" than "male" and "female."*

ExecuVoice Tutorial: Adding Your Favorite Application

The ExecuVoice manual doesn't pay enough attention to something you're certain to want: controlling your favorite applications with ExecuVoice. This tutorial will show you how, using the PIF Editor application icon. This is an unlikely candidate for voice control, but it's an icon that everyone should have. Feel free to substitute your favorite application icon for the PIF Editor icon in the instructions that follow.



NOTE: *When the ExecuVoice software was installed, the installation program automatically created a new program group called ExecuVoice and filled it with icons copied from your Accessories group and several icons from your Media Vision Multimedia Tools group. The programs were not copied, only the icons.*

1. Launch ExecuVoice.

   Double-click the Voicebar icon found in the ExecuVoice program group. (If this is the first time you've used ExecuVoice, it will prompt you for your name.) You now see the Voicebar.



TIP: *ExecuVoice comes with an excellent multimedia tutorial. Run the tutorial by clicking Voicebar's Help (?) button and then selecting Tutorial. The tutorial in this chapter and the tutorial provided with ExecuVoice complement each other nicely, covering a different set of features. If you haven't run the ExecuVoice tutorial, it's a good idea to do so now and then proceed to step 2.*

2. Practice Your Speaking Techniques.

   Click the microphone button to wake up Voicebar so it will respond to your spoken commands. Now say "Move Voicebar" several times to move the Voicebar to the top of the screen and then back to the bottom. Next, hide the list of *active words,* the available commands, by saying "Toggle active words" (or by clicking Voicebar's book button). Say "Toggle active words" (or click Voicebar's book button) a second time to display the list. Voicebar displays the list of commands available for the window that has the current focus, the window with the highlighted title bar.

3. Prepare the PIF Editor Icon for Launching by Voice Control.

   Now copy the PIF Editor application icon from the Accessories group to the ExecuVoice group so it can be launched by voice control. Use the Program Manager to switch to the Accessories window. Click the PIF Editor icon once to highlight it. Press F8 to display the Copy Program Item dialog box. Scroll through the To Group list until you've located the ExecuVoice choice and then select it. Once you click the OK button, the PIF Editor icon is copied to the ExecuVoice group.

4. Bring up the List of Applications.

   Now you see that PIF Editor has been added to your ExecuVoice group. Display the ExecuVoice Voicebar window by pressing ALT-TAB until it's visible. If the Active Word list doesn't show, say "Toggle active words." Now say "Bring up." You see that PIF Editor has been added to the list of applications that can be launched.

5. Train the New Command.

   Since this is a new command, ExecuVoice doesn't know what sounds to expect. Now train ExecuVoice so it will understand you when you request the PIF Editor. Click the PIF Editor item in the active word list. You now see a check mark. Now click the Train button to begin training. When prompted by the dialog box, repeat "PIF Editor" with a consistent voice (you can say either "PIF Editor" or "P...I...F... Editor"). When ExecuVoice is satisfied with your pronunciation the dialog box disappears and a green circle appears to the left of PIF Editor in the active word list. The circle indicates that ExecuVoice is now trained for this word.

6. Launch PIF Editor.

   Launch PIF Editor by saying "PIF Editor." Notice that the 32 standard commands are available, as well as a smaller set of generic commands for user-added applications. We don't need to do anything with PIF Editor, so say "Close" now.

7. Remove PIF Editor from Voice Control.

   You are unlikely to need voice control over PIF Editor so let's remove it from the ExecuVoice group. Switch to the ExecuVoice group. Click the PIF Editor icon to highlight it. Now press DEL and confirm you wish to delete it. The PIF Editor program remains intact, and the original icon also remains in the Accessories group. You've only eliminated a copy of the icon in the ExecuVoice group.



TIP: *ExecuVoice is very good at recognizing voices without training. However, it's highly recommended that you train ExecuVoice for the commands that can get you into or out of trouble: Yes, No, and Cancel.*

ExecuVoice Tips and Tricks

The following hints will help make ExecuVoice more attentive to your specific needs.

SPEECH LEVELS If the Voicebar light frequently shows red, you should lower the gain in the mixer (Pocket Mixer or Pro Mixer). In general, the closer you bring the microphone to your mouth, the better the recognition will be. Remember, if you train ExecuVoice, you need to train it with the microphone in the same position that you will later use when giving commands.

AVOID SHORT UTTERANCES Short utterances, "hi" and single digit numbers and letters, are difficult to match against the sound templates because there isn't much of a sound sample to compare. Whenever possible use a long word or connected-word group in lieu of a short word. For example, ExecuVoice can more easily recognize numbers that are spoken as "number one" and "number two" than just "one" and "two." Radio operators have employed this strategy since the infancy of radio, communicating letters like "b" and "c" by stating words such as "Bravo" and "Charlie" that are much easier to distinguish amidst radio static.



TIP: *When you add an application icon to the ExecuVoice program group window, consider using a longer-than-necessary name. For example, if you're adding an icon for a MIDI Jukebox player program, call it "Jukebox Player" rather than "JB."*

WHY TRAINING FAILS Probably the single biggest complaint among users of ExecuVoice is that ExecuVoice can't recognize their words after they've carefully trained it. Usually, due to "performance pressure," the speaker has used an unnatural voice during training. Typically the words are spoken too fast and with too much annunciation while training. To solve this problem, follow the technique of radio and TV reporters who conduct interviews. They often start off by asking a mundane question, to allow the other person to relax into normal voice, before asking the tough questions. Start the training process by saying "and now the next word is" just before selecting the train button.

EXECUVOICE WON'T RUN WITHOUT PROGRAM MANAGER ExecuVoice needs Program Manager, in at least a minimized icon state, to call up applications with the "Bring Up" command. It won't run with PC Tools or Dashboard or similar shell programs that replace Windows' Program Manager.

CONFUSION OVER CIRCLE SYMBOLS The circle symbols in front of the vocabulary commands in the active word list are confusing. The green circle means the command is trained already. The red circle means that there is no template for this command and you must train it. The lack of a circle means that you haven't trained this command, but it is not necessary to do so; ExecuVoice has a speaker-independent template for this command.

Upgrading from ExecuVoice

If speech recognition has become a tool you can't live without, but you feel hemmed in by the limited vocabulary of ExecuVoice, you have options. A number of companies offer affordable yet capable products for the PC that work with your Media Vision sound card.



NOTE: *As this book goes to press, Media Vision doesn't have an upgrade path for ExecuVoice owners. Due to the popularity of speech recognition software, it's likely that Media Vision will broaden its product line in the near future. Check with Media Vision's sales department for the latest product offerings.*

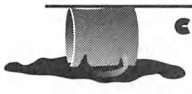
Dragon Systems licenses its speech software or speech technology to a number of firms, including Media Vision (in the form of ExecuVoice), IBM, and Microsoft. Dragon Systems has a licensing arrangement with IBM whereby IBM sells a speaker-independent speech recognition product called IBM VoiceType Control. The major difference between this package and ExecuVoice is that the command vocabulary can be customized, so you can control any software product that has menus. IBM VoiceType Control operates under Windows 3.1 and carries a suggested list price of $129 including a microphone. It comes with 350 previously trained commands and the ability for a total of 4000 commands. The product can be purchased through Dragon Systems, whose phone number is (617) 965-5200.

Covox Inc. sells a family of inexpensive speech recognition software and hardware bundles. Their most popular package, Voice Blaster, is found in many retail computer stores (please note: there is no connection between Covox's Voice Blaster and the Creative Labs Sound Blaster sound card). For a list price of $119.95 you get software for both DOS and Windows. Each version handles up to 1,023 customizable commands so you can control any software package you desire. Be aware that this is not a speech-independent product. You will have to train it to recognize each voice command, and once trained, it will respond to your voice only. In addition, it doesn't come preprogrammed to work with your favorite applications like Lotus, Excel, or Quattro. You must create macros (small programs) that execute a sequence of keyboard commands in response to each voice command.

The Covox setup is different than that of ExecuVoice. Covox provides a "pass-through" module that connects to your parallel printer port, drawing its power from that port. You plug your parallel printer cable into this module (your use of the printer is unhampered). A Covox-provided headset with an electric microphone is plugged into this module, and a slender cable runs from the module to your sound card's microphone input. The module ensures that the microphone output is optimally tailored for your sound card.

This module, together with Covox's experience in designing templates, allow their software to run on computers with relatively little RAM memory and a slow (by today's standards) CPU. For example, the DOS version of

Voice Blaster runs on a PC-AT-class machine (80286). While ExecuVoice requires 2MB of RAM memory from Windows, the Windows version of Voice Blaster requires only 320K. Covox Inc. can be reached at (503) 342-1271.



CAUTION: *At this time, Voice Blaster should not be purchased for use with Media Vision's Thunder Board. According to Covox, the Thunder Board's microphone gain is higher than that of the Sound Blaster (the game card that the Thunder Board emulates). The high gain doesn't cause problems with normal recording from the microphone, but it does create problems for Voice Blaster. Voice Blaster will work with Media Vision's Pro Audio sound cards.*

For successful use of Voice Blaster with your Pro Audio card, be certain to set the mixer high, to 70 to 80 percent of the maximum volume. In addition, you must use the Test Recognition Screen to adjust Voice Blaster for the background noise in your area.

More Background on Speech Recognition Technology

Considerable effort on the part of your computer is required to match templates against the incoming sounds. First, the incoming sound is recorded by the sound card as digital audio. Then the speech software must perform extensive calculations to extract the frequency components. The components are then matched against the table of templates. An exact match against a template is impossible, because no one can possibly speak a word in exactly the same fashion every time, so guidelines exist for a match that is close enough. This matching must also be done quickly so you're not waiting while the computer is deciding how to respond to your command.

The speech recognition software "stretches" or "compresses" the incoming sound pattern to accommodate differences in speech style and physical characteristics. The geometric relationships between the formants remain the same, but the precise frequency of each peak varies considerably even among native speakers of the same sex and age. The difference is even more pronounced when comparing the speech of men to women or children, who on average speak at a higher pitch.

An interesting facet of ExecuVoice is that when you train it for particular words, it actually learns to better recognize *all* the words in its dictionary. At the same time it learns the specifics for a command, it adopts to your overall style of speech. Higher-end speech recognition software—running on

more powerful hardware than a 80386- or 80486-based PC—continuously adapts to your voice: the more you use the speech recognition system, the better it becomes at recognizing your voice. See Chapter 5 for a discussion of digital signal processing and the DSP chip that has the power for this type of speech recognition.

The speaker needs to use the correct microphone to have the greatest success using ExecuVoice without training. The best performance is provided by a microphone similar to the one originally used to capture the voice samples for building the speaker-independent templates. When you buy PowerPak from Media Vision, you receive such a microphone. It's necessary to use a similar microphone, because microphones vary significantly in the nuances of how they convert an audio sound to an audio electrical signal that's captured by the sound card for speech recognition. For this reason, the ideal microphone for karaoke singing with your PC is probably not a good match for the speaker-independent templates.



NOTE: *The mathematical and computer techniques used for speech recognition are fundamentally the same as those used for oil exploration and undersea detection of submarines through passive sonar systems. A tremendous amount of money was invested in creating templates for recognizing the sound of individual Soviet ships—many of which are now rusting away in their final port of call in the Russian Far East.*

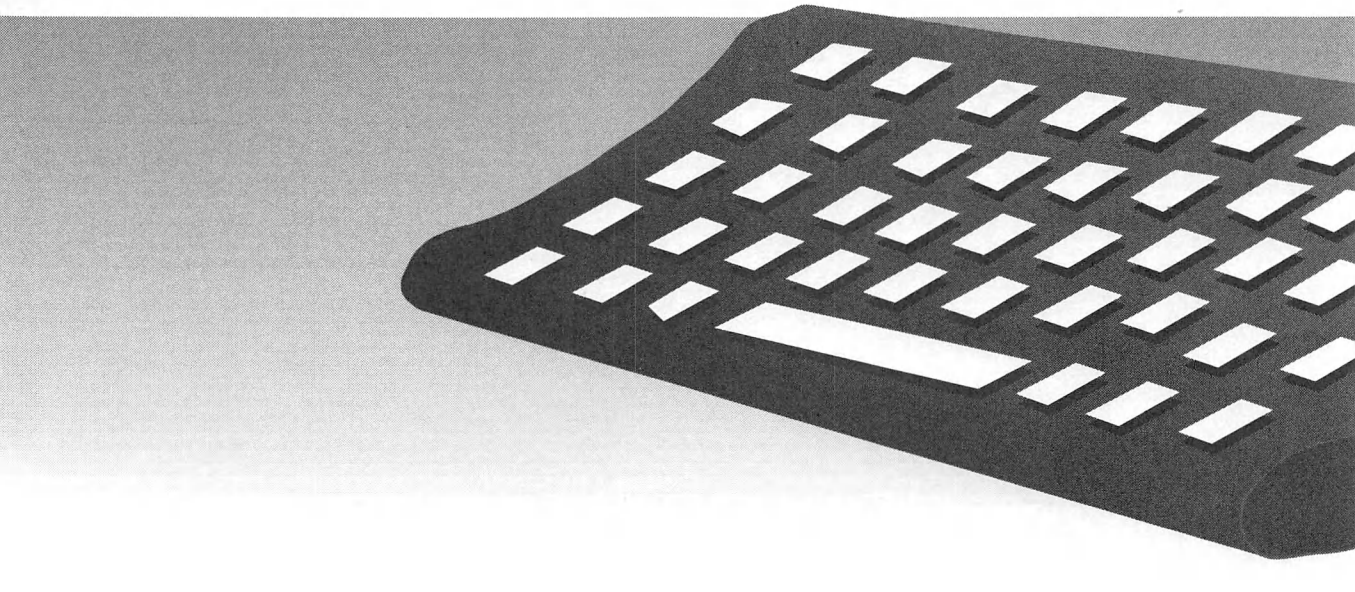
What's Next in Speech Recognition

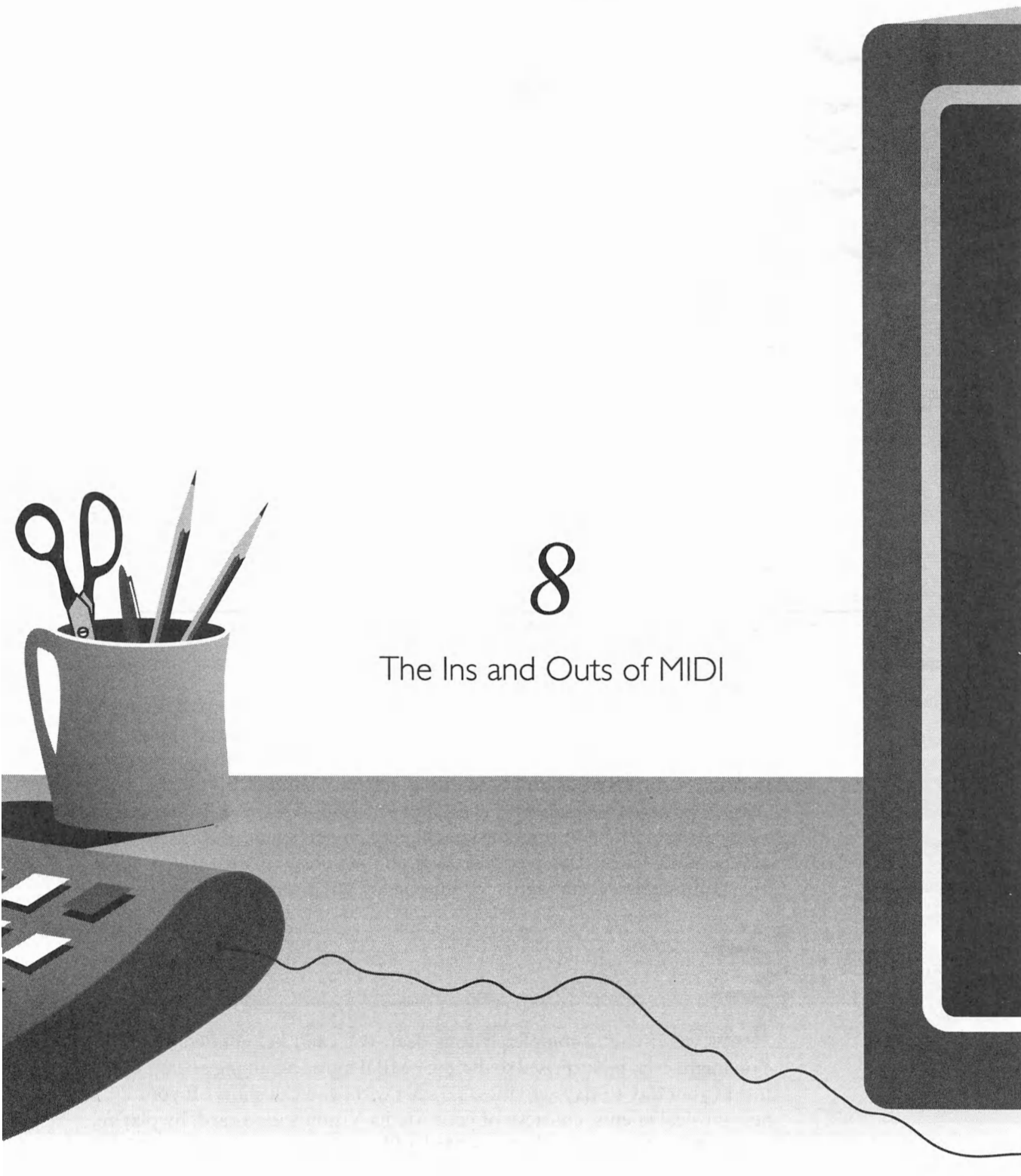
A lot has happened in speech recognition over the last few years. Large-vocabulary speaker-independent speech recognition systems are commercially available that can handle upwards of 30,000 words and can drive virtually any software without accessing a keyboard or mouse. These $2,500-plus systems are already popular for certain commercial applications, such as order processing and medical dictation. Machine dictation is becoming popular with doctors, such as radiologists and pathologists, who file many written reports. *Continuous speech* systems, which don't require the user to methodically insert pauses to differentiate words and connected-word groups, are not yet commercially proven.

There are several challenges facing speech recognition technology. Foremost is the fact that the office environment is not friendly towards speech recognition. The office is already noisy, and few people like to advertise their lack of dexterity with software by vocalizing commands such as "Stop, Stop, Undo That." The last major complication is the most difficult to address: humans don't talk like computers. Only when we see a quantum jump in computer horsepower, accompanied by a better scientific understanding of speech patterns, will it be possible for computers to fluently understand

continuous speech. You know that speech recognition software has arrived when the computer can understand a very human utterance such as "Let's see here, I think I'd like to work on last week's letter to Mom...."

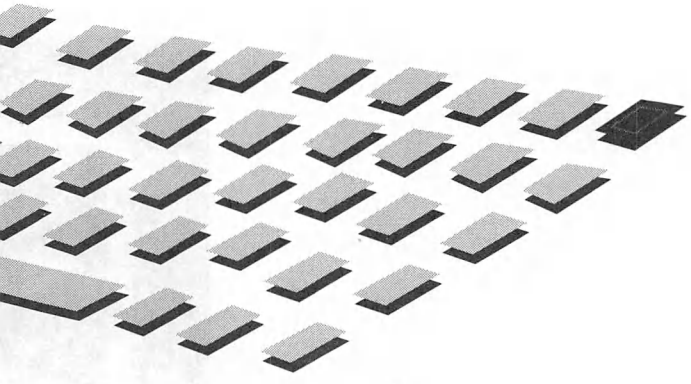
On the bright side, the near-term future for speech recognition on the desktop PC is very exciting. The new generation of powerful PCs, such as the 80486 and Pentium, have the horsepower necessary for serious speech applications. With millions of speech-capable machines out there, you can expect exciting developments to be around the corner.





8

The Ins and Outs of MIDI



ANYONE who has ever touched a keyboard synthesizer has a good head start understanding and using MIDI (musical instrument device interface), the technology that creates musical sounds with electronics and brings the wonders of music under the spell of the computer. For those unfamiliar with MIDI, a *keyboard synthesizer* embodies in a single package both a music keyboard, similar to a piano keyboard, and a sound-generating unit called a *synthesizer* with electronics that *synthesize* (produce) musical sounds.



NOTE: *Don't fret if you lack a keyboard synthesizer. Every Media Vision sound card has an FM synthesizer built in that plays MIDI music.*

This chapter starts with the basics of MIDI before diving into the nuances of turning your PC and sound card into the leaders of the band. What you read about synthesizers and sequencers will crystallize as you go through a tutorial featuring Midisoft's Recording Session, MIDI software that's included with the Pro AudioStudio 16 and Pro AudioSpectrum 16, as well as many of the multimedia upgrade kits. The chapter concludes with a chronicle of how MIDI standards have progressed, culminating with the MIDI Mapper and Multimedia PC standards for support of MIDI music.

WHO USES MIDI?

Even if you're completely tone-deaf, you can't help but enjoy MIDI. You might even be surprised to discover MIDI music assuming an important role in your day-to-day activities. To start with, you can show off your PC's new musical talents, courtesy of your Media Vision sound card, by playing tunes on the Microsoft Windows Media Player.

The year 1983 was a watershed year for MIDI. In that year, MIDI Specification 1.0 was adopted by a group of major electronic musical instrument manufacturers, establishing standards that guaranteed a synthesizer bought from one company could operate with a synthesizer or keyboard bought from another company. Prior to the specification, the electronic music equipment market was a Tower of Babel, which had a chilling effect upon customer demand. Your purchase decision wasn't just which keyboard synthesizer to buy, you also had to decide which company was going to become your music partner.

Amateur and professional musicians alike now use MIDI instruments—relatively high-priced, but great-sounding synthesizers—to play electronic music. MIDI instruments, including electric guitars and drum machines, often serve as background performers in a recording studio, somewhat lacking in creativity but never missing a beat or needing a smoke. For amateur musicians, MIDI provides a wonderful opportunity to expand one's musical horizons beyond individual performance on a single instrument. You can even buy software programs that convert your MIDI music into a beautifully formatted, printed score.



TIP: *Much of the confusion surrounding MIDI is simply due to terminology. Common words are given very special meanings. For example, the electronics that create MIDI musical sound is often called a MIDI instrument. However, the term* instrument *is often used by authors to mean the sound of the original instrument—such as a harp—whose sound is synthesized. A careful reading of the text is required to know which meaning of* instrument *is intended.*

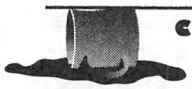
MIDI; and the computer smarts that the PC brings to MIDI, is ideal for students, young people, and anyone with a thirst for learning music. For novices to music, MIDI can be a boon to education. You can buy music programs that teach music fundamentals such as keyboarding and *chords* (combinations of notes) that sound pleasing. More advanced students can hone their orchestration techniques, experimenting with such skills as *transposition*, the changing of musical key. You can even attach the popular Miracle Piano Teaching System to your computer through the MIDI port.



TIP: *The NotePlay program on the disk that accompanies this book teaches music fundamentals in a fun learning environment.*

Last, but not least, MIDI music is becoming an important part of business presentations and demonstrations. No one can deny the impact of sound to

draw attention. A little background in MIDI can go a long way in impressing an important client at a critical point in the sale.



CAUTION: *The copyright issues that apply to CDs, audio tapes, films, and printed work also apply to music stored as a MIDI file: You must have permission for commercial use of someone else's original creation. If you plan to include MIDI music in a performance or presentation, make certain that you have permission from the author to use the music, or that the music is in the public domain. Look to purchase CDs and floppy disks containing sound and music samples created expressly for commercial use.*

THE ESSENCE OF MIDI

The single most important characteristic of MIDI is that it's a language for musical expression, not a recording of actual music. MIDI music files don't contain the actual sound of a performance; they contain notes and other MIDI commands—often referred to as *MIDI messages* or *MIDI events*—that tell MIDI synthesizers how to recreate the performance. The two most important messages are the Note On command, which tells the synthesizer to begin play of a note, and the Program Change command, which tells the synthesizer which musical instrument sound to play.

MIDI COMPOSITIONS ARE REVISABLE

With a tape recording or CD you can listen to the recorded music but you can't change it. With MIDI *sequencer software* you can tinker with the composition as if you're editing a document in a word processing program. You can easily rearrange the music, switch the instruments assigned to a melody, and change all aspects of the music composition to your heart's content. Another major benefit of MIDI is that MIDI files are much more compact than digital audio recordings for the same music. A MIDI file might be as small as one-hundredth (one percent) the size of an equivalent digital audio file.



TIP: *If you've recently bought a Pro AudioStudio 16 or Pro AudioStudio 16XL, the Quick Tour multimedia introduction to your Media Vision sound card and software has an excellent introduction to MIDI. Quick Tour points out the benefits and features of MIDI and MIDI sequencer programs, such as Midisoft's Recording Session.*

THE ANATOMY OF A MIDI NETWORK

If you own a keyboard synthesizer or other MIDI device, and you want to connect these to your computer through the sound card, you'll need to get the MIDI Mate box (see Figure 8-1), an optional purchase from Media Vision. The MIDI Mate box attaches to your sound card's MIDI/Joystick port.



NOTE: *Any sort of music equipment that possesses a MIDI interface, so it can talk to another piece of MIDI equipment, is called a MIDI device. Since* MIDI device *is a nice shorthand for saying "a keyboard synthesizer or a keyboard or a drum machine or a sound module or..." you'll frequently see this term. Also, for the purpose of brevity, when we speak of a synthesizer, we generally mean any MIDI device capable of making sounds.*

You can then plug the external MIDI devices into the MIDI Mate box. Figure 8-2 shows what a typical hobbyist MIDI setup with a keyboard synthesizer looks like.

With a MIDI setup like this you can play the music keyboard, listening to the keyboard's built-in synthesizer through the keyboard synthesizer's

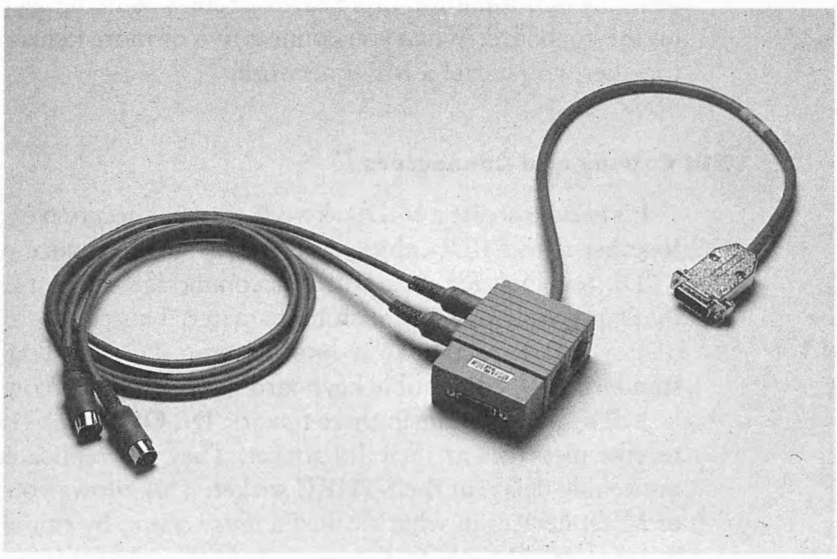


FIGURE 8-1 *The MIDI Mate box for attaching MIDI devices to your sound card*

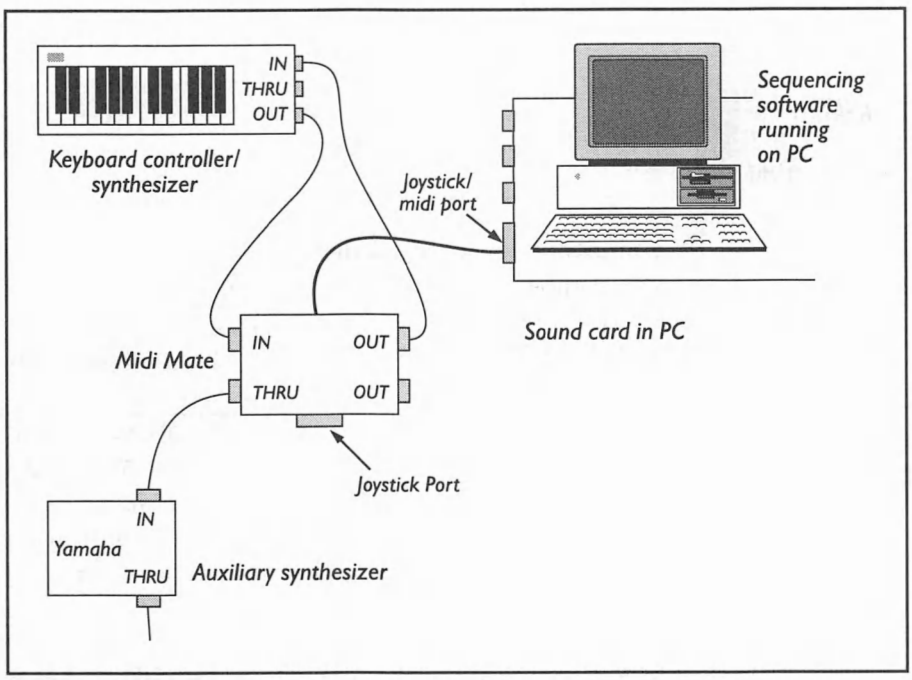


FIGURE 8-2
A typical external MIDI network

speaker. By running sequencer software on the computer, you can also record the sequence of MIDI notes sent across the network by the keyboard synthesizer, storing them to disk as a MIDI file. Later you can load the file into the sequencer to play back the MIDI composition. You can't help but be impressed when you first hear your composition play without your hands on the keyboard. When you connect two or more items of MIDI equipment together, you create a MIDI network.

MIDI Cabling and Connectors

It's easy to create a MIDI network. Just connect two or more MIDI devices together with MIDI cables. And it's easy to recognize which equipment is MIDI. Just look for sockets that accommodate a 5-pin DIN-type connector that's precisely one-half inch in diameter. This connector is more common than you'd expect: take a look at your PC's keyboard connector. The standard IBM-compatible keyboard has this type of connector.

MIDI sockets come in three flavors: IN, OUT, and THRU. MIDI devices receive messages at their IN socket. They are replicated exactly, without noticeable delay, at their THRU socket. This allows you to connect a chain of MIDI devices in what's called a *daisy chain,* by running cables from one instrument's THRU to the next one's IN. Messages are passed down the

chain, giving all the MIDI equipment the opportunity to see every message. MIDI OUT adds MIDI messages contributed by the keyboard synthesizer or other MIDI device to those received at MIDI IN.

Cabling for Dual Control

If you want either the keyboard synthesizer or the computer-based sequencer to control your MIDI network, you need two cables running between the MIDI Mate box and the keyboard synthesizer:

- A cable that goes from the MIDI Mate OUT to the keyboard synthesizer's IN—sending messages from the computer to the keyboard's built-in synthesizer—causing music to play on the synthesizer.
- A cable that goes from the keyboard synthesizer's OUT to the MIDI Mate IN—sending messages from the keyboard to the computer—enabling the computer's *sequencer software* to record the sequence of notes you play.

PLAYING MIDI MUSIC

If you're a Windows user, the Microsoft Windows Media Player makes it a snap to play MIDI files. Just load the file and click on the Play button. If you really savor electronic music, you'll enjoy the MIDI JukeBox music utility provided on the diskette that comes with this book. With this program you can select a stack of MIDI songs that'll keep your mood light while you struggle with your home tax program.

If you want to control more than the volume of the music, you have to run a sequencer program, which means wading knee-deep into MIDI. Fortunately, Media Vision provides their customers with an excellent entry-level sequencer called Recording Session.

Your Sound Card's Internal Synthesizer

Placing a basic-level synthesizer on a sound card is an important innovation. With this synthesizer, you don't need a keyboard synthesizer or expensive MIDI network to play MIDI music. The tutorial later in this chapter shows you how to use the Recording Session sequencer to play a MIDI file on the sound card's FM synthesizer.



NOTE: *The FM synthesized music you hear from games and most programs generally isn't MIDI music. Most programs directly control the FM synthesizer since they don't need the extra capabilities (and overhead in terms of program complexity and music file size) of MIDI.*

THE ROLE OF SEQUENCERS

The two essential components of MIDI—besides the music, of course—are the synthesizer and the sequencer. In the past, a sequencer was an expensive piece of MIDI equipment that served two complementary roles for a MIDI network. Its first role was as the boss, sending MIDI commands—music notes and instructions, such as "switch from an electric piano to an acoustic piano sound"—to a MIDI synthesizer. These commands came from previously recorded MIDI music files, perhaps MIDI music jingles bought at your neighborhood computer store, or original compositions banged out in your basement recording studio. The sequencer's second role was as a scribe, jotting down the corresponding music notes as you played the keyboard synthesizer or hit the drum pad on a MIDI drum unit or a similar action to control MIDI equipment. Today, a *sequencer* is a software program, running on your PC, that does the same thing a dedicated sequencer did prior to the PC, but much better and at less cost.

Controllers

Controllers are MIDI devices that can't make sound, but instead control devices that do make sound (such as synthesizers). A keyboard controller is the bare keyboard without any sound-generating capability. Other controllers include foot pedals, pitch bend wheels, drum pads, breath controllers, and the like. A sequencer (either sequencer software running on a PC or a MIDI device dedicated to sequencing) is also considered a controller.

THE "NOTE ON" AND "PROGRAM CHANGE" MESSAGES

Every time a note is played in a live performance, perhaps by pressing the keyboard or hitting a drum pad, a *Note On* message is sent across the MIDI network. You can't see this message, so we'll describe what it looks like to the computer and to the MIDI devices that receive it. The Note On message contains three items of information: note value, channel number, and *attack velocity,* a measure of how hard the key (or drum pad or foot switch...) is struck.

Note Value

All notes are assigned a *note value* between 0 and 128 that indicates the desired pitch. For example, middle C is assigned the value of 60, and each increment of 1 in note value raises the pitch by one *semi-tone* (half-step). This gives a total range of around ten and one-half octaves, which goes well beyond the range needed for the piano and most instruments. Figure 8-3 shows how the note values are assigned to the piano keyboard. Note that middle C is 60 and concert A, the note that an orchestra tunes by, is 69.



TIP: *If you are unfamiliar with some of the music terminology used in this chapter, you might want to look for a good book on basic music theory in your local bookstore or library.*

Channel Number

A MIDI synthesizer "tuned" to a channel responds to a Note On or other message for that channel only. *MIDI channel numbers,* which run from 1 through 16, are like television channels. If your television set is tuned to channel four, that's all you see until you change channels. Keyboards and other controllers (MIDI devices that send messages for controlling other devices) are also tuned to a channel. When a key is pressed, the note is sent across the MIDI network with the assigned channel number as part of the message.

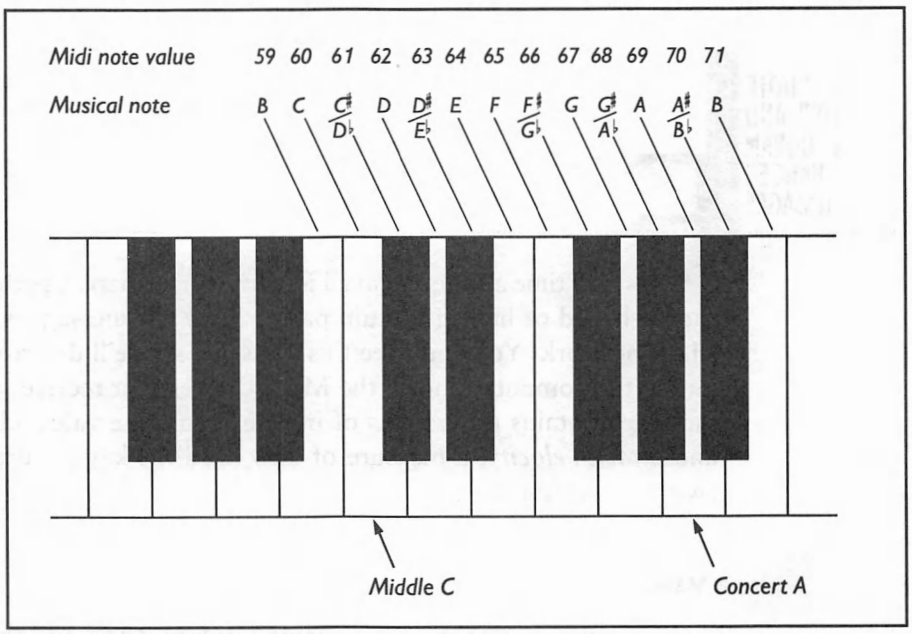


FIGURE 8-3 A piano keyboard showing the pitch value assigned to each key

SYNTHESIZERS

Synthesizers come in all shapes and sizes, with a variety of names. In the most general sense, a synthesizer is any MIDI device that synthesizes sound. A sound module (also known as an expander) is a synthesizer with no keyboard, switches, dials, or other controls that a person can operate.



NOTE: *Musicians often refer to a synthesizer as a* synth.

Instrument Quality

The sound quality of synthesizers varies enormously according to the technology embodied in different synthesizers. A synthesizer that uses wavetable synthesis has much more realistic instrument sounds than a synthesizer using FM synthesis technology (see Chapter 4 for background information). For example, there is a striking difference between the sounds of the Pro AudioStudio 16XLs Korg wavetable synthesizer and the FM synthesizer found in the 16XL and all other Media Vision sound cards. In fact, the sound quality of the Korg wavetable synthesizer rivals that of professional-caliber MIDI synthesizers because it embodies the same technology.

Patches and Program Changes

A synthesizer can generate many different musical sounds, emulating both well-known instruments as well as sound effects like falling rain. The General MIDI standard, which will be discussed in more detail later in this chapter, has specific patch assignments for each instrument sound. A patch assignment is a number assigned to an instrument sound. For example, among the 128 standard patch assignments, number 40 is assigned to the synthesized violin sound. If you want a General MIDI-compatible synthesizer to make the sound of a violin, you—actually your sequencer software—must send the MIDI Program Change command that tells the synthesizer to play patch 40 when it receives the subsequent notes. The term *patch assignment* is often abbreviated to *patch*.



NOTE: *In the "good old days" of music synthesis, synthesizers the size of a refrigerator (the compact model) were given a new timbre, or characteristic sound, by moving the electrical patch cables from one socket to another. The term* patch *has lived on as the MIDI term to specify a specific instrument, instrument voice, or voice—terms used interchangeably for specifying a musical timbre.*

Patches are sometimes referred to as voices. The term *voice* was probably adopted because the human voice and a musical instrument share a common quality, a uniqueness in their sound. A single voice—either human or instrument—is so unique that it can be discerned in a large music hall overflowing with myriad sounds.

Polyphony

Synthesizers are multi-timbral and polyphonic. *Multi-timbral* means that the synthesizer can simultaneously play several different instruments sounds. *Polyphonic* means that the synthesizer can play more than one note at a time. For example, the MPC standard for the most basic synthesizer for a Multimedia PC—the type of synthesizer found in the common game card, and the ability-level of all Media Vision sound cards—specifies that the synthesizer must be capable of playing six melodic notes and five percussive notes at the same time, for a total polyphony of eleven voices.

The Melody Channels

Synthesizers can play *melodic* voices, like an acoustic piano or banjo sound, in which the pitch and other characteristics of the voice can be varied

as if a real instrument was in play. The melodic voices are played on the so-called *melody channels* of the synthesizer. Typically each channel plays a single melody voice at any one time. These melody voices do include the sounds of a few *percussion* instruments (instruments that are struck), such as the Melodic Tom and Reverse Cymbal, which have multiple pitches.

The Percussion Channel

Since pitch isn't relevant for most percussion sounds, the typical synthesizer has a so-called *drum channel* (or more correctly named the *percussion channel*) in which a different percussion instrument is sounded for each note played on the drum channel. For example, the General MIDI percussion assignments specify that a Note On message with a 60 value (middle C pitch for a melodic channel) plays the Hi Bongo sound. A typical synthesizer can play many percussion voices (on the percussion channel) at one time, while it's much more limited in the polyphony of melody voices.

A MIDI TUTORIAL WITH RECORDING SESSION

Now that you've got some ideas about what MIDI is and how it works, we'll give you some hands-on training. The tutorial illustrates how you can change instruments, control the volume and tempo, and select which parts of a MIDI composition to play. If you own a Pro AudioStudio 16 or have ordered the Pro Audio PowerPak upgrade, a Windows program called Recording Session by Midisoft should already be on your hard disk. If you don't have this program, don't worry. The figures and descriptions in this chapter are more than adequate for you to follow along.

Recording Session is a special type of software known as a MIDI sequencer. As its name implies, a *MIDI sequencer* allows you to create and replay a sequence of MIDI events—quite simply, a MIDI sequencer allows you to create, edit, save, and replay MIDI sound files. Recording Session is a modern MIDI program that shields you from the complexities of MIDI and actually allows you to work with a more familiar interface. Musicians are accustomed to working with musical scores and mixers rather than with technical MIDI terms like Note On/Off and Program Change. Thus, Recording Session displays music in standard musical notation for the composer

and translates it into MIDI language when actually communicating to the hardware, in this case, your Pro Audio sound card.

Start Recording Session by first double-clicking on the Recording Session icon in Program Manager. When you start Recording Session for the first time, it needs to know what type of MIDI device you have. The MIDI Drivers Setup dialog box appears for you to select a MIDI device for Recording Session to use for playing music. (See Figure 8-4.)

If you're using the standard Windows drivers as included with your Pro Audio sound card, select Multimedia Drivers for Windows 3.1 and choose Base-level Setup (channels 13-16) for the correct MIDI Mapper. Now click the OK button and you should be all set to go. Recording Session will remember your settings and should no longer bring up that dialog box.

Two views are displayed when you first start Recording Session, as shown in Figure 8-5. The first is called the Score View, which starts empty when the program is first loaded. This window shows your music in standard musical notation—notes are highlighted in this window as they are being played. The second window just below is the Mixer View. This is the panel where all the adjustments for volume, tempo, and other controls are found. All the buttons are labeled appropriately, and their functions are similar to what you'd find on a regular cassette player.

FIGURE 8-4

A Recording Session driver setup

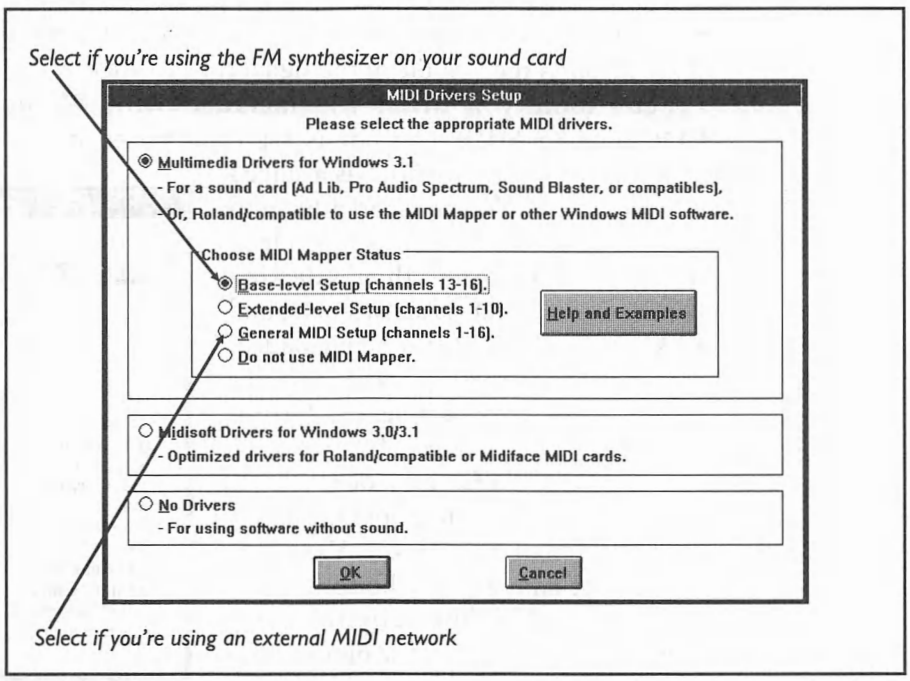
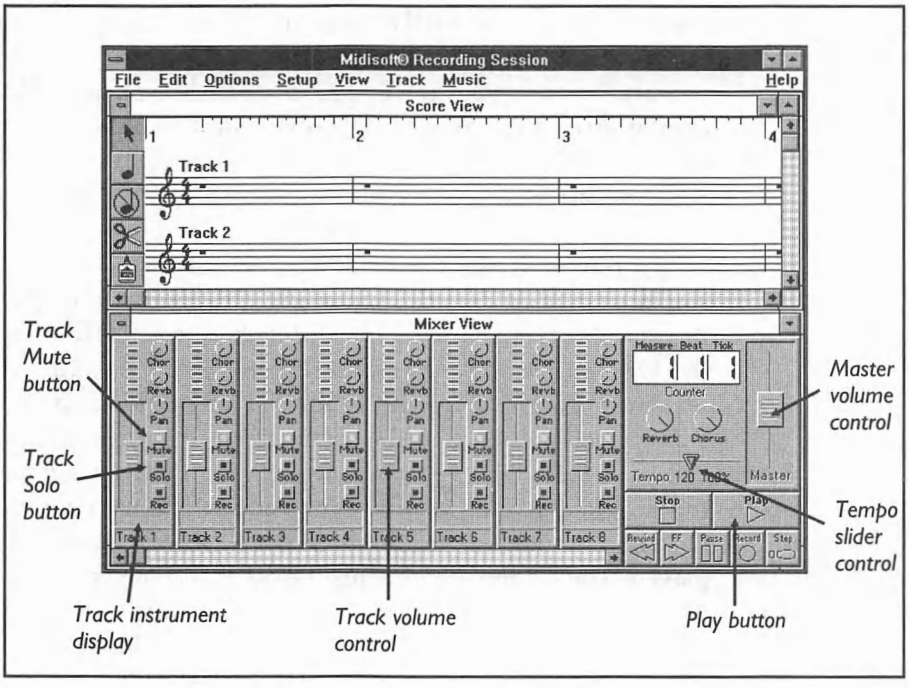
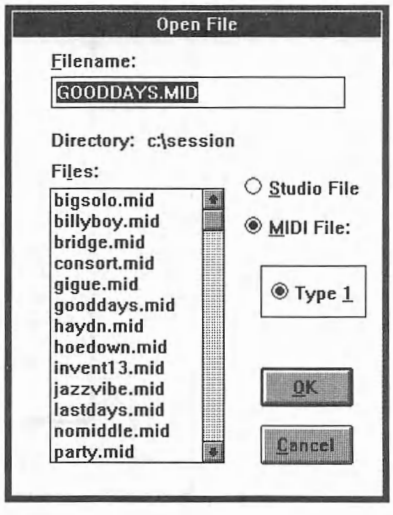


FIGURE 8-5
Score View and Mixer View



The individual track volume controls adjust the loudness of the particular track in comparison to the other tracks. The LED lights above the volume slider displays the volume of the signal for the track.

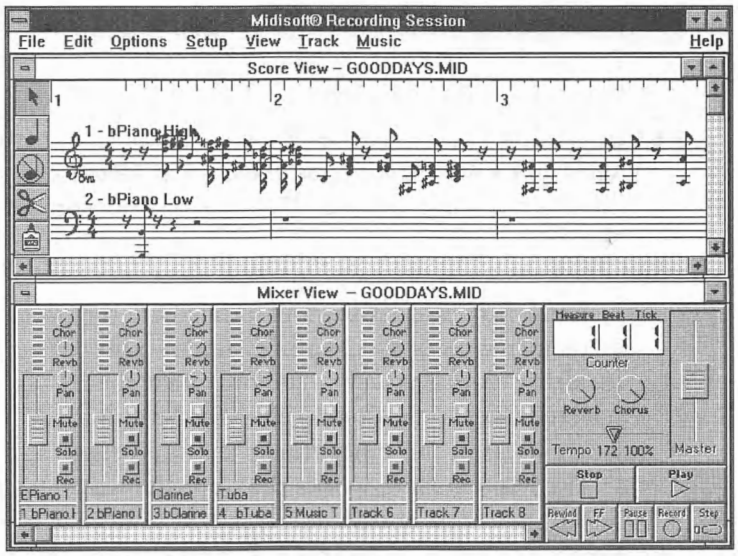
Let's modify a MIDI file included with Windows 3.1 called GOODDAYS.MID. This file is typically found in the C:\WINDOWS directory, or where Windows is installed in your system. You can load a file into Recording Session by selecting Open from the File menu, then selecting GOODDAYS.MID, as shown here, and clicking OK. As the file is being loaded, you should see these messages appear in sequence: "Converting...", "Auto-Notating...", "Drawing...".



Once the MIDI file is loaded, you see that the Score View now contains many notes and that the Mixer View has instrument names at the bottom of the different track volume controls. (See Figure 8-6.) Click the Play button once to listen to the music.

FIGURE 8-6

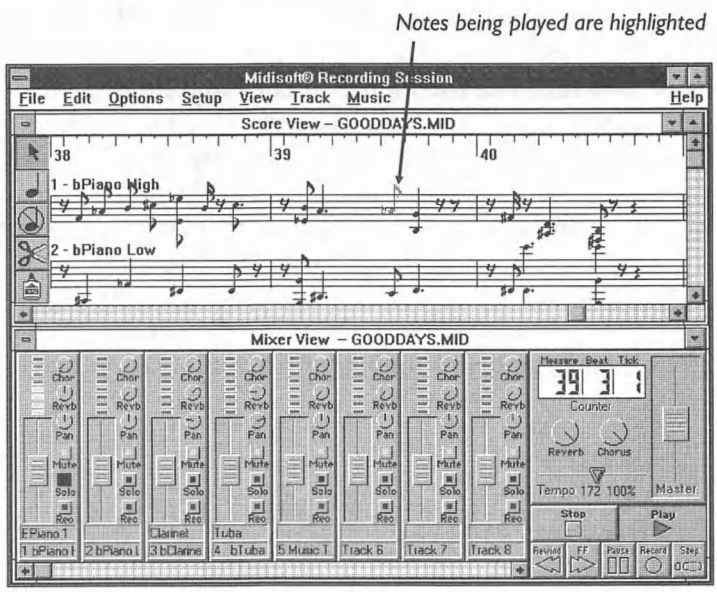
GOODDAYS.MID music in Score View



Now that you have an idea of what the music sounds like, let's experiment with some MIDI concepts. Click the Play button and start the song again. This time, click the Solo button for track 1—which is supposed to be the sound of a grand piano. (See Figure 8-7.) Now you only hear the

FIGURE 8-7

Playing GOODDAYS.MID



part for track 1. Whenever there's a note in the Score View that corresponds with track 1, it is highlighted and you hear it play on your Pro Audio card.



NOTE: *The Chorus (Chor) and Reverb (Revb) buttons do not serve any functions when used with most Pro Audio sound cards. These effects are only available on professional-level equipment such as the Roland MT-32 or Roland SCC-1 sound modules or the Pro AudioStudio 16XL.*

The Solo button allows you to isolate the parts played by the different instruments recorded on the different tracks. You can select Solo buttons for other tracks as well—you only hear the tracks with their Solo buttons selected. Example, if you select the Solo buttons for tracks 2 and 3, you won't hear all the other tracks that may have notes.

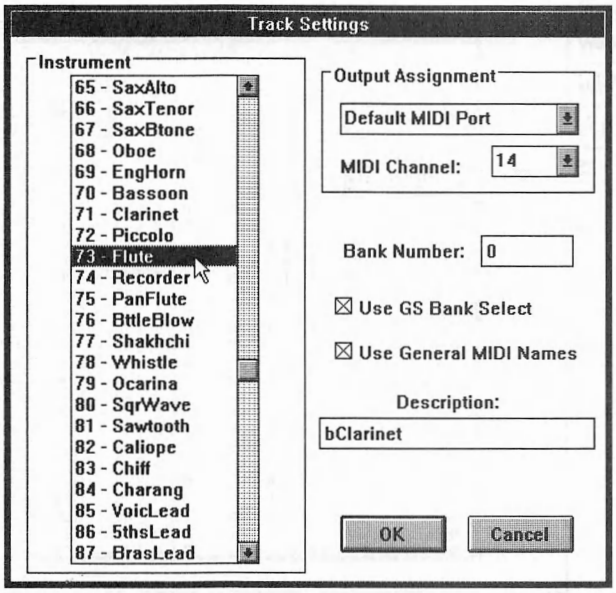
The Mute button works the opposite way—it silences the track. If you select the mute button for track 3, you hear all the other instruments except for the part on track 3. You can use this to see how the GOODDAYS.MID song sounds without the bass guitar and/or drums by selecting the Mute buttons for tracks 1 and 2, respectively.



TIP: *To listen to all the tracks, make sure that none of the Solo or Mute buttons are selected.*

Another interesting feature of a MIDI sequencer is its ability to change the speed, or *tempo* of the song. For GOODDAYS.MID the original tempo is 120. Use the mouse to click and drag the tempo slider to increase the tempo to 239. Now click the Play button, and the song scoots along as fast as a freight train! Try the tempo set at 34, and the song seems to drag.

You can also change the instrument used on any track. Click the name of the instrument on that particular track's control panel to access the Track Setting dialog box. Try changing track 3, originally a clarinet (instrument 71), to a flute (instrument 73) as shown on page 181. Experiment freely with the instrument assignments for the different tracks and you may stumble onto a combination that sounds great.

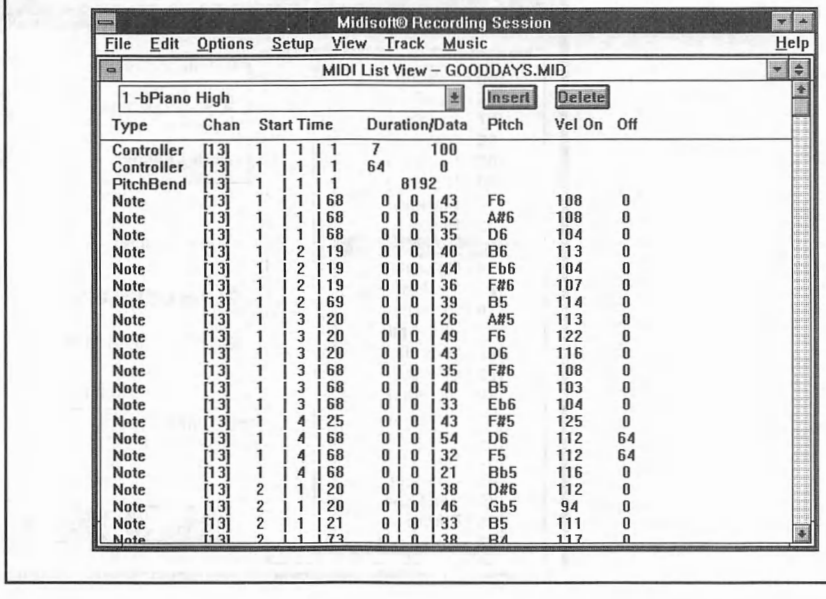




NOTE: *MIDI tracks relate to how the sequencer organizes its music information. The term "track" was borrowed from the audio industry where it refers to recording tracks. A MIDI track is truly the equivalent of a tape recorder track. Each track on the sequencer can potentially contain a distinct MIDI recording, and you can play back one, all, or any combination of tracks at the same time (you can even record one track while playing another). For example, the original studio recording for a movie almost certainly has the music and speech on different sound tracks. This makes it possible to dub a 1950s-vintage Japanese-made Godzilla movie with English dialogue without ruining the wonderful Godzilla noises or background music.*

To get an idea of what a traditional programmer had to do to create music with MIDI just a few years ago, select MIDI List View from the View menu. The cryptic commands and numbers shown in Figure 8-8 are the MIDI messages, sent to MIDI synthesizers and other devices, that early adopters of MIDI had to deal with. Recording Session translates all the notes in Score View into these MIDI messages.

FIGURE 8-8
MIDI List view showing MIDI commands



Type	Chan	Start Time	Duration/Data	Pitch	Vel On	Off
Controller	[13]	1 | 1 | 1	7 100			
Controller	[13]	1 | 1 | 1	64 0			
PitchBend	[13]	1 | 1 | 1	8192			
Note	[13]	1 | 1 | 68	0 | 0 | 43	F6	108	0
Note	[13]	1 | 1 | 68	0 | 0 | 52	A#6	108	0
Note	[13]	1 | 1 | 68	0 | 0 | 35	D6	104	0
Note	[13]	1 | 2 | 19	0 | 0 | 40	B6	113	0
Note	[13]	1 | 2 | 19	0 | 0 | 44	Eb6	104	0
Note	[13]	1 | 2 | 19	0 | 0 | 36	F#6	107	0
Note	[13]	1 | 2 | 69	0 | 0 | 39	B5	114	0
Note	[13]	1 | 3 | 20	0 | 0 | 26	A#5	113	0
Note	[13]	1 | 3 | 20	0 | 0 | 49	F6	122	0
Note	[13]	1 | 3 | 20	0 | 0 | 43	D6	116	0
Note	[13]	1 | 3 | 68	0 | 0 | 35	F#6	108	0
Note	[13]	1 | 3 | 68	0 | 0 | 40	B5	103	0
Note	[13]	1 | 3 | 68	0 | 0 | 33	Eb6	104	0
Note	[13]	1 | 4 | 25	0 | 0 | 43	F#5	125	0
Note	[13]	1 | 4 | 68	0 | 0 | 54	D6	112	64
Note	[13]	1 | 4 | 68	0 | 0 | 32	F5	112	64
Note	[13]	1 | 4 | 68	0 | 0 | 21	Bb5	116	0
Note	[13]	2 | 1 | 20	0 | 0 | 38	D#6	112	0
Note	[13]	2 | 1 | 20	0 | 0 | 46	Gb5	94	0
Note	[13]	2 | 1 | 21	0 | 0 | 33	B5	111	0
Note	[13]	2 | 1 | 73	0 | 0 | 38	B4	117	0

In this section, you've begun to see the flexibility of MIDI and the ability of MIDI sequencers like Recording Session to bring the powerful tools of music composition and editing to a user-friendly level. There are actually many more complex operations, such as transposition and quantization—which are difficult or impossible tasks to do manually—that have been simplified and automated by the power of a PC. To *transpose* is to adjust all notes of a composition or portion of a composition by a specified interval in pitch, changing the key in which the music is played. To *quantize* is to cause notes to be aligned at standard intervals such as a quarter, eighth, or sixteenth of a note.



TIP: *If you're a musician or composer and MIDI appeals to you, check Chapter 10, "Third-Party Software," for descriptions of some of the MIDI sequencers that are available for the Pro Audio sound card. Please note that there are capable shareware sequencers, such as WinJammer, which is a fully functional MIDI sequencer except for saving to disk.*

PLUG-AND-PLAY MIDI

A progression of standards has led MIDI equipment to become plug-and-play; you can buy MIDI devices, software, and music from different sources and, with great likelihood, they'll work together.

The first widely accepted standard was the MIDI Specification 1.0. This set standards for cabling between MIDI devices, the basic MIDI message types, and the format and content of these messages. The MIDI specification is maintained by the International MIDI Association (IMA).

After MIDI Specification 1.0 took force, several other developments pushed MIDI along in the direction of being a plug-and-play standard for hassle-free computer-based music creation. These developments include the Standard MIDI File Specification and the General MIDI Instrument Assignments. More recently, to support MIDI on the Multimedia PC, Microsoft has promoted the Microsoft Authoring Guidelines for MIDI files and has included the MIDI Mapper applet that enables MIDI files composed for a non-General MIDI synthesizer to play the proper sounds on a General MIDI synthesizer.

Exchanging Files: Standard MIDI

Standard MIDI was created to be a universal MIDI file format by which sequencers can exchange files. As a result of the Standard MIDI File Specification 1.0, a MIDI file recorded in a professional recording studio in Paris or Geneva can now be played with your shareware MIDI sequencer software downloaded from a bulletin board.



TIP: *When working with sequencer software, you'll probably be given a file format choice when saving your MIDI music to a disk file. In the case of Recording Session, you can save the file as either a Studio file or a MIDI file. The Studio file is Recording Session's own format which can be read and written only by Recording Session. If you want to load your MIDI music into another sequencer program, you should save the file as MIDI. Recording Session gives you a choice of the type of Standard MIDI to create. Be careful to select Type 1. Type 0, an older format, combines all your tracks into one. Unfortunately, when you receive a MIDI file, you can't tell from the file extension which type of MIDI file it is.*

General MIDI Instrument Assignments

The MIDI File Specification 1.0 was a great step forward, but one complication remained: MIDI music composed for one synthesizer could sound completely different when played on another. Many of the details of MIDI implementation, such as the number assigned to each instrument sound, weren't standardized yet. For example, patch 13 might be a marimba sound for one synthesizer and a completely unrelated instrument sound for another synthesizer.

The General MIDI standard established additional guidelines for law and order in MIDI. The most important of these new specifications was one that standardized the patch numbers for instrument sounds. Other important specifications set a minimum standard of 24-note polyphony, required that all synthesizers have an operating mode where they respond to all 16 channels, assigned middle C a note value of 60, and reserved channel 10 for percussion sounds.

Microsoft's Authoring Guidelines

When Microsoft added multimedia capabilities to its Windows software, a difficult juggling act had to be performed. Windows needed to support General MIDI equipment capable of 24-note polyphony, yet the typical sound card, which could scarcely be ignored because its sales now numbered in the hundreds of thousands of units, had an FM synthesizer limited to six- or eleven-note polyphony. In addition, there were (and still are) many pre-General MIDI synthesizers to be accommodated.

Microsoft's solution was to define MPC (Multimedia Personal Computer) standards for supporting MIDI equipment and also to provide the MIDI Mapper software program for flexibility in accommodating non-General MIDI standard equipment.

The two MPC standards for MIDI created by Microsoft are base-level synthesizer and extended-level synthesizer. General MIDI devices support 32-note polyphony and 16 channels, but PC owners are more likely to own less expensive equipment, such as a Sound Blaster, that's not as capable. By establishing authoring guidelines for these two "model" synthesizers, Microsoft hoped to encourage composers to create MIDI music files for these synthesizers as well as for the General MIDI devices that the professionals and serious audiophiles use.

A *base-level synthesizer* matches the capabilities of the FM synthesizer common to inexpensive sound cards (primarily, at that time, the AdLib and the Sound Blaster) which contain a Yamaha 3812 chip. This type of synthesizer responds to MIDI messages on four channels, 13 through 16. It can simultaneously play six melody notes on three instruments addressed at channels 13-15 plus at least five percussion notes (on the drum channel, channel 16), for a total polyphony of eleven notes.

The *extended-level synthesizer* reflects the capability of the most popular external (not on a sound card) synthesizers, such as the Roland MT-32/LAPC. These synthesizers are capable of simultaneously playing sixteen melody notes on nine instruments addressed at channels 1-9 plus sixteen percussion notes on the extended-synthesizer drum channel, channel 10. The

Pro AudioStudio 16XL Korg wavetable synthesizer is an extended-level synthesizer.

The purpose of Microsoft's dual authoring standards is to create a single MIDI file that plays on either a base- or extended-level synthesizer. In the single file are two copies of the composition: the base-level synthesizer version uses channels 13-16, while the extended-level synthesizer version uses channels 1-10. An example of a file like this is CANYON.MID, which you will find in your Windows directory.



TIP: *You can identify whether a MIDI file is authored to Microsoft's standards by loading it with the Windows Media Player. When Media Player loads a MIDI file, it checks the file header for a flag that indicates whether it has been authored according to Microsoft's standards. If not, Media Player displays a message telling you that the file may not play correctly.*

Microsoft's dual authoring guidelines for MPC MIDI music files has met with mixed success. You can obtain collections of prerecorded music that support base-level and extended-level synthesizers, but for the most part the typical MIDI file out there is General MIDI. For example, while there's reported to be nearly a thousand MIDI files posted on CompuServe, most are General MIDI.

THE MICROSOFT WINDOWS MIDI MAPPER

The Windows MIDI Mapper is designed to provide device independence for MIDI devices. It tries to do the same thing that printer drivers do, which is to hide the details on how to control the printer so you and your word processing package won't get tied up in knots trying to figure out how to do subscripts or some other special printing task.

The MIDI Mapper is the traffic cop for MIDI music data flowing from a sequencer or other program to MIDI devices. When you play a General MIDI file, the MIDI Mapper maps (reroutes to different channels and reassigns instrument patches) the MIDI notes and other messages so the song plays as intended on a non-General MIDI synthesizer. This non-General MIDI synthesizer may be either the synthesizer on your sound card or an external synthesizer connected to the MIDI port of your sound card.



NOTE: *Some software packages, including sequencers, give you a choice between going through the MIDI Mapper or directly addressing your sound card through software drivers, such as the Voyetra OPL-3 FM synth driver.*

When you install Windows on your machine, the MIDI Mapper contains setup information for about a half-dozen of the most common pre-General MIDI synthesizers, called MIDI Mapper *setups*. When your Pro Audio software was installed, the installation program automatically added a MIDI setup for your sound card. (See Chapter 3, "System Software and Drivers," for details.) If you own MIDI equipment that isn't already supported by the MIDI Mapper, you can edit an existing MIDI map or create a new one.

The MIDI Mapper unifies in a single setup three types of *maps* for redirecting MIDI message traffic: Setup Map, Patch Map, and Key Map.

The Setup Map

The Setup Map is organized by channel, with up to 16 row entries for the 16 channels. Its most obvious role is to change the channel address for a MIDI message. For example, a General MIDI file has percussion sounds on channel 10, while your sound card's FM synthesizer has percussion sounds on channel 16. In addition, for each channel you can choose where to direct the messages. The MIDI mapper provides a small menu of choices. You can select either the driver for your sound card, such as the Voyetra OPL-3 FM synth driver, or the MIDI port on the sound card, which is the gateway between your computer and an external synthesizer.

Patch Maps

Each Setup Map may contain many Patch Maps which, among other changes, can map the instrument patch number for Program Change messages. For example, suppose a General MIDI song specifies instrument 33, but your pre-General MIDI synthesizer has that instrument at patch 39, so the patch number in this Program Change message becomes 39. You can have up to 16 Patch Maps, one for each channel.

Key Maps

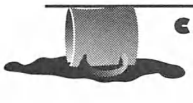
Each Patch Map in turn can contain Key Maps. Where the Patch Map maps melody voices, the Key Map maps percussion voices on the percussion channel. Synthesizers play a different percussion instrument for each note directed to the percussion channel, as explained in the "Percussion Channel"

section of this chapter, but these assignments vary from synthesizer to synthesizer.

Summarizing: A MIDI Mapper Example

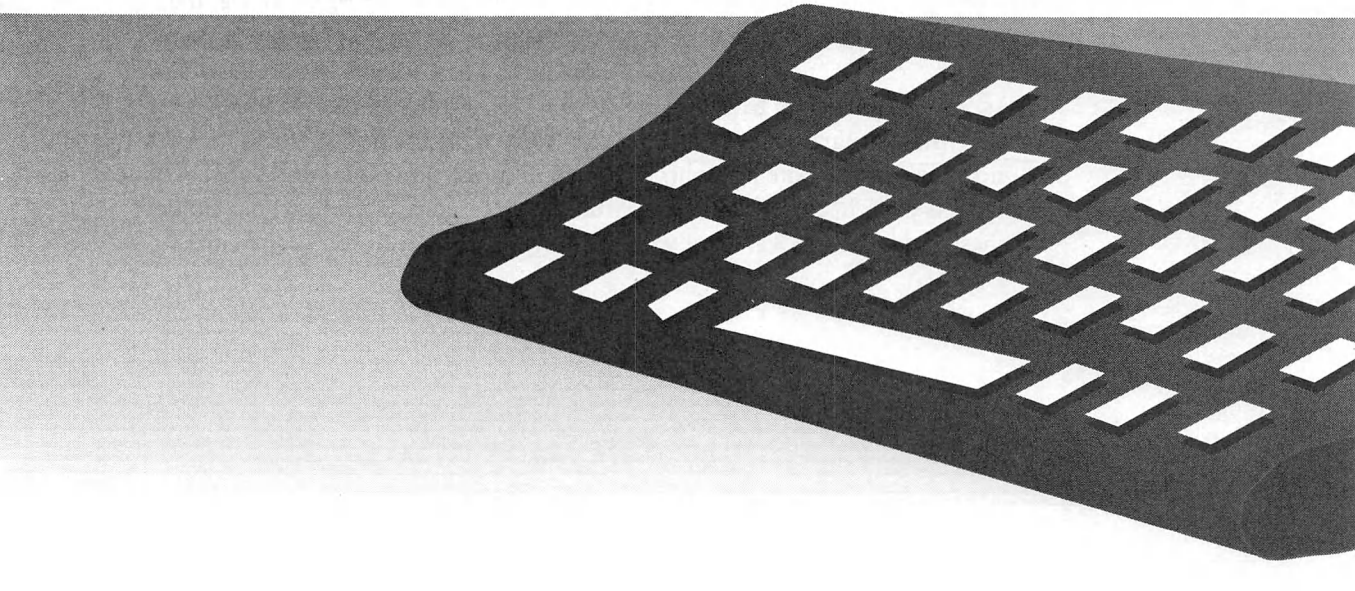
Here's an example of what a MIDI Mapper setup might do for you. Assume you have a General MIDI file with music for channels 1 through 16. According to usual convention, the most important melodies are found in the lower channels. Should you play this MIDI file with Pocket Recorder or another MIDI player, chances are you hear nothing or just an occasional note that happens to be on channels 13 through 16. In order to get a sense for what this music is like, you have to map the channels, changing the channel assignments for MIDI notes and control messages, before they are directed to the sequencer.

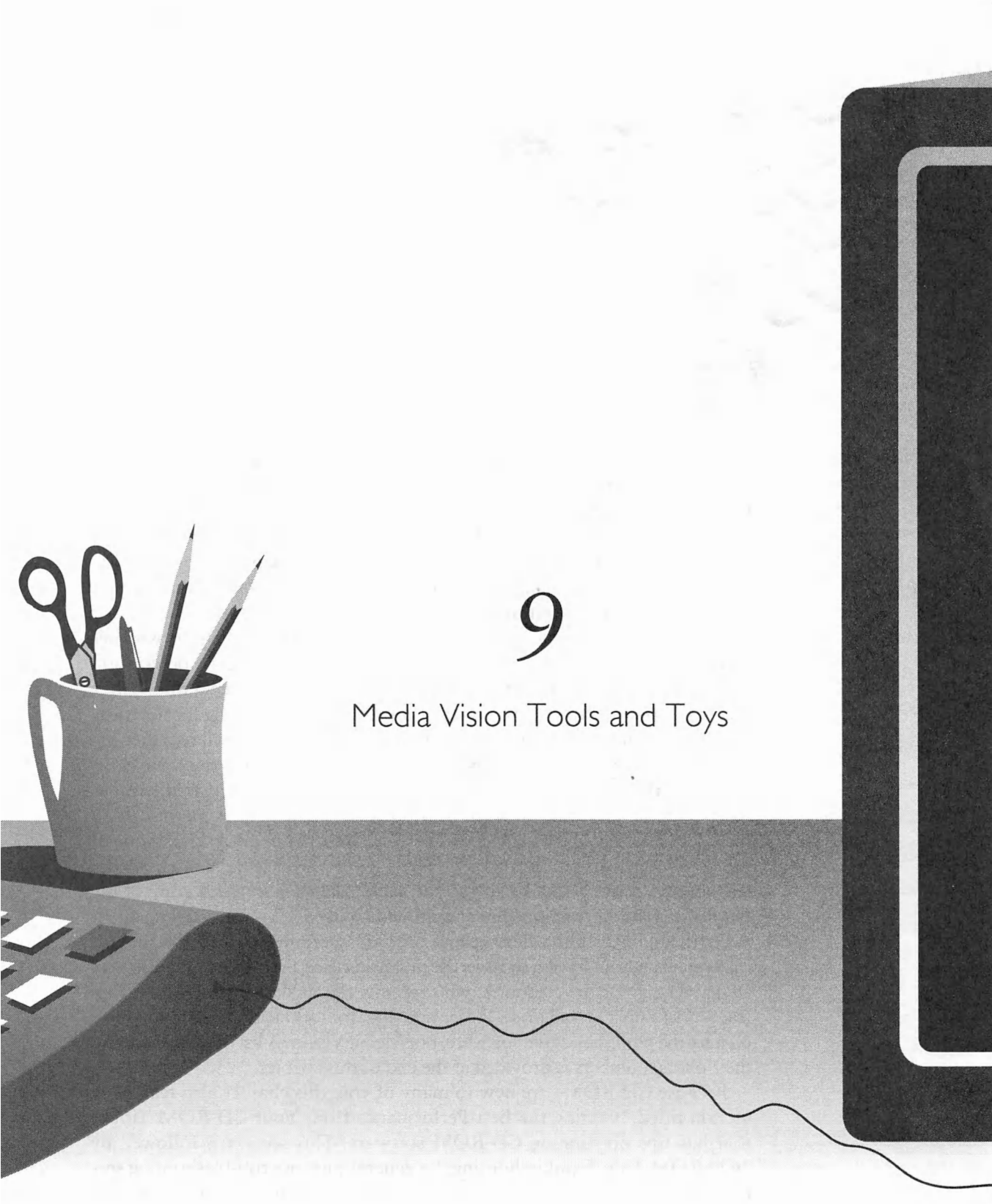
Obviously, there is no way you can play all of the instruments sounds of a General MIDI song if the song was composed with the full 32-note polyphony of General MIDI. You have to pick which instruments to play by remapping selected channels. A MIDI setup could be created to reroute the most important melody sounds from channels 1 through 3 to channels 13 through 15, and then route the percussion notes from channel 10 (the General MIDI standard for percussion) to channel 16 (game card/base-level synthesizer standard).



CAUTION: *The complexity of the MIDI Mapper foils even experienced MIDI musicians. If you do plan to experiment with the MIDI Mapper, it's a good idea to copy the current MIDI Mapper configuration, MIDIMAP.CFG, to a floppy disk before experimenting. The mechanics of setting up the MIDI Mapper are documented in the Windows User's Guide.*

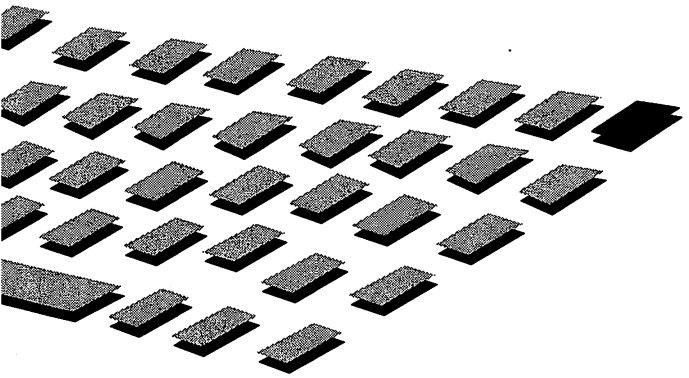
As you can see, the MIDI Mapper can be useful, but there simply is no way to fit a square peg (32-note polyphony General MIDI music) into a round hole (the 11-note polyphony FM synthesizer on your sound card). The solution is evident in the Pro AudioStudio 16XL: place a professional-caliber synthesizer like the 16XL Korg wavetable synthesizer onto the sound card.





9

Media Vision Tools and Toys



THIS chapter covers the software provided by Media Vision that doesn't fit neatly into the other chapters. The software described here is bundled with Media Vision's multimedia upgrade kits that include a CD-ROM drive. These kits contain many of the hottest titles in multimedia today, such as Compton's Interactive Encyclopedia, 7th Guest, and PC Karaoke. If you're shopping for software, be certain to check Chapter 10, which lists many more software packages available from third parties—ones that haven't been bundled with a multimedia upgrade kit but that are outstanding.

This chapter delivers information that's certain to be helpful whether you've already purchased a kit or are looking to buy. You get a description of each software package and see screen shots of the multimedia titles. After the description, there's help on installation and troubleshooting for that title. We've contacted each publisher's technical support line to pull together the most frequently asked questions so you won't have to make the same call.

The software reviewed in this chapter is referred to as *bundled* because Media Vision has arranged with the top multimedia and game publishers to include their software with Media Vision multimedia upgrade kits. None of the software described in this chapter is owned by Media Vision. Media Vision pays a small royalty to the software publisher for each copy of the publisher's software shipped in a multimedia upgrade kit. This arrangement is beneficial to the publisher because they are guaranteed a sizeable amount of revenue without having to advertise or market their product. This is also very advantageous for the customer, who receives top-quality software for a tiny fraction of the full retail price. Please note that for technical support, you must contact the publisher of the software, not Media Vision. A list of publishers and their phone numbers is provided at the end of this chapter.

Because CD-ROMs are new to many of you, this chapter also features a section titled "Getting the Best Performance from Your CD-ROM Titles" that has tips on running CD-ROM software. This section is followed by "CD-ROM Title Troubleshooting," a general-purpose troubleshooting section for CD-ROM software that covers the most common problems encoun-

tered in installing and running CD-ROM software provided by Media Vision. Complications with each specific title are discussed in the Installation/Troubleshooting section for that title. Solutions to CD-ROM drive problems are presented in Chapter 11, "A CD-ROM Compendium."

Each multimedia kit contains a different assortment of titles, so don't expect to get all the titles in this chapter with your CD-ROM drive. Appendix A catalogs which titles have been shipped with which multimedia kit. Be aware that Media Vision frequently freshens their assortment of titles according to what's most popular, so the kit you buy may have a more up-to-date assortment of titles.



NOTE: *Most of the CD-ROM titles described here incorporate extensive graphics, music, and speech that can easily take up hundreds of megabytes on CD-ROM. We call these "multimedia titles" to distinguish them from older-style, floppy-disk-based games and other software programs that have limited graphics and sound. Since CD-ROMs are now relatively inexpensive to manufacture, software companies are moving toward the distribution of all software, multimedia or not, on CD-ROM discs.*

A CATALOG OF MEDIA VISION'S BUNDLED CD-ROM TITLES

The titles are organized under four groupings: Educational, Reference, Entertainment, and Productivity. Some run under Microsoft Windows only, some under DOS only, and one, Battle Chess Enhanced CD-ROM, has versions for both DOS and Windows.

Educational Titles

Media Vision offers two educational titles for children, both from Brøderbund (pronounced "brew-der-bund").

Where in the World is Carmen Sandiego? (Deluxe Edition) by Brøderbund

This fantastically popular DOS software is better than ever as a CD-ROM title. In moving their software from floppy to CD-ROM, Brøderbund has taken advantage of the abundant space on the CD-ROM to add music,

digital audio voices, and onscreen animation with great graphics. Where in the World is Carmen Sandiego? is great fun and a wonderful educational tool for kids, exposing them to new places as they solve crimes around the world with the high-tech Acme CrimeStopper gadgetry. The thief is heading for a hideout in one of 60 locations around the world, with 20 suspects for the crime. To win and advance your career, you must track the criminal to the final destination and arrange for an arrest warrant. The opening screen, with the CrimeStopper gadgetry showing, is seen in Figure 9-1.

INSTALLATION/TROUBLESHOOTING Although you select Pro AudioSpectrum in the setup, be aware that the software runs on the Sound Blaster emulation part of your sound card. Some problems have been reported with DOS 6.0 and EMM386 using HIGHSCAN. Disable HIGHSCAN if you're having problems.

Arthur's Teacher Trouble by Brøderbund

Brøderbund has launched a Living Books series for Microsoft Windows, which provides a fun learning environment that motivates children to learn to read. Arthur's Teacher Trouble, by renowned children's book author Marc Brown, is the story of Arthur the Aardvark, a third-grader who is having "a hard day at the office" that any school child can relate to. Figure 9-2 shows Arthur, in glasses, with his new teacher, the infamous Mr. Ratburn.

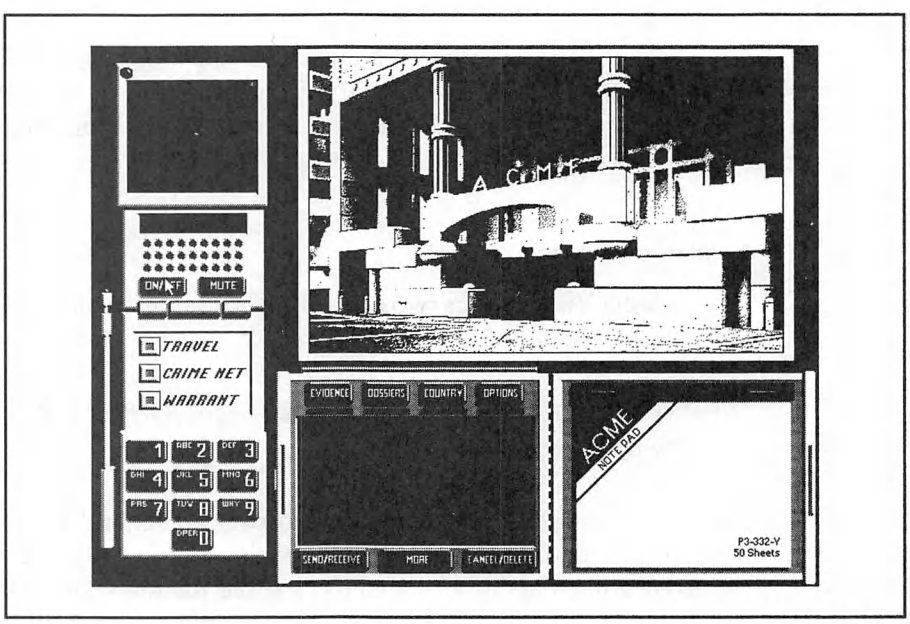
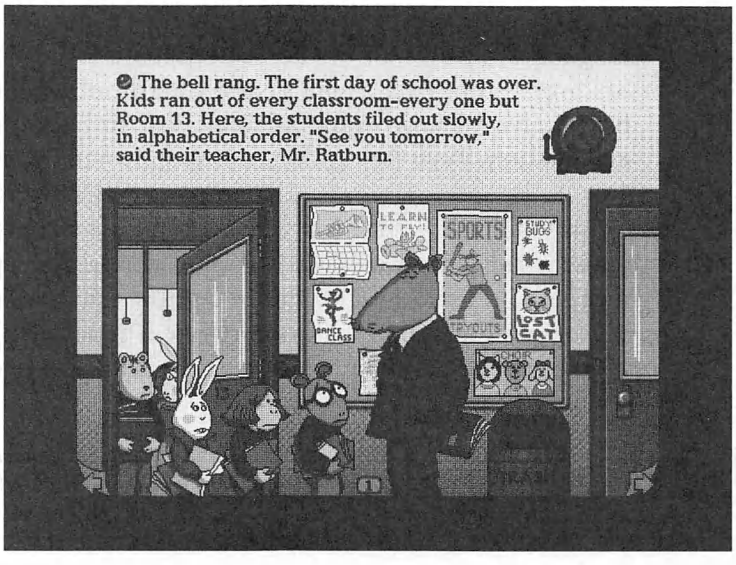


FIGURE 9-1 *Where in the World is Carmen Sandiego? (Deluxe Edition)*

FIGURE 9-2

Arthur's Teacher Trouble



You can run Arthur's Teacher Trouble in either a passive mode (it reads to you while you follow the words) or in an active mode in which you explore objects on the page before moving on. For example, click the school bell to see it shudder and hear it ring. This title is great for bilingual education: you can switch at any time between English and Spanish.

If you like this title, you should check out Grandma and Me. Two more titles, Tortoise and Hare and New Kids on the Block, should be out for the IBM-PC by the time this book is on the shelf.

INSTALLATION/TROUBLESHOOTING This title won't run unless you have a 256-color video driver.

Reference Titles

In a few years, buying an expensive encyclopedia or other reference tome on paper will be considered quaint. The titles described in this section demonstrate the CD-ROM-based research tools we'll all use going into the next century.

Mayo Clinic Family Health Book by Interactive Ventures, Inc.

The world famous Mayo Clinic has put together a Microsoft Windows multimedia reference title that's fully as intriguing as an interactive game.

Curious about the heart? Start your search by selecting "heart" or "ultrasound," and soon you witness an illustration of echocardiography, or diagnostic ultrasound of the heart (Figure 9-3). You can see a physician holding a probe over a man's chest with the ultrasound image of his normal heart valve pulsing on the monitor. Just sit back and enjoy the narrator's explanation. Turn the captions on, as shown in Figure 9-3, to see how those 15-syllable medical words are spelled as they're spoken.

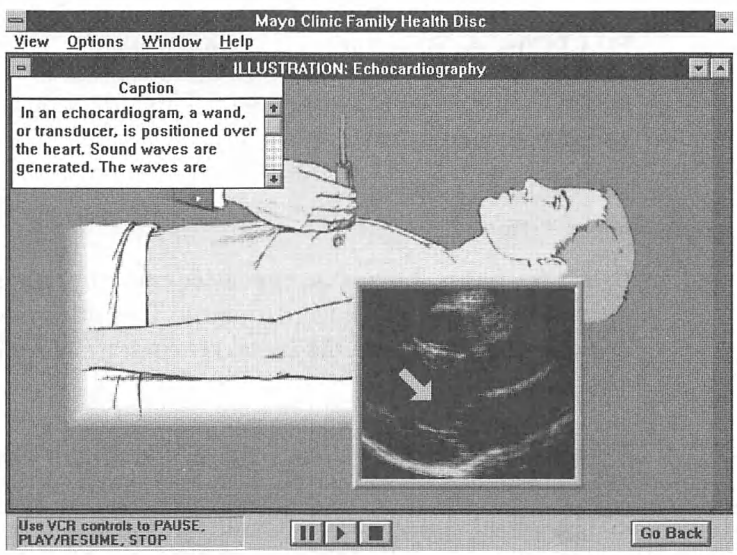
This multimedia title is practical, too. For example, if you're in a panic to know what German measles looks like, you can see a photograph of German measles and listen to a narration on how the disease progresses. Sony, the publisher of this disc, will soon release a series of CD-ROMs that features parts of the body. The first offering, the heart, is scheduled for release by the end of 1993.



TIP: *Skip the introduction by pressing* SPACEBAR. *Hit* ESC *to terminate an animation sequence or narration.*

INSTALLATION/TROUBLESHOOTING The Mayo Clinic Family Health Disc uses an unusual technique that they call split-track audio to squeeze more than 90 minutes of audio onto the CD-ROM in addition to all of the pictures and text. Unfortunately, this technique causes problems with some CD-ROM drives. A common complaint is that the narration can't be heard. Make certain that Audio on the Options menu is checked and that you've

FIGURE 9-3 *Mayo Clinic Family Health Book*



cranked up the volume for the CD-ROM source in your mixer software. Also, don't be surprised if you hear mono only—possibly from one speaker only—because only the introduction and photo tour of Mayo Clinic are in stereo.

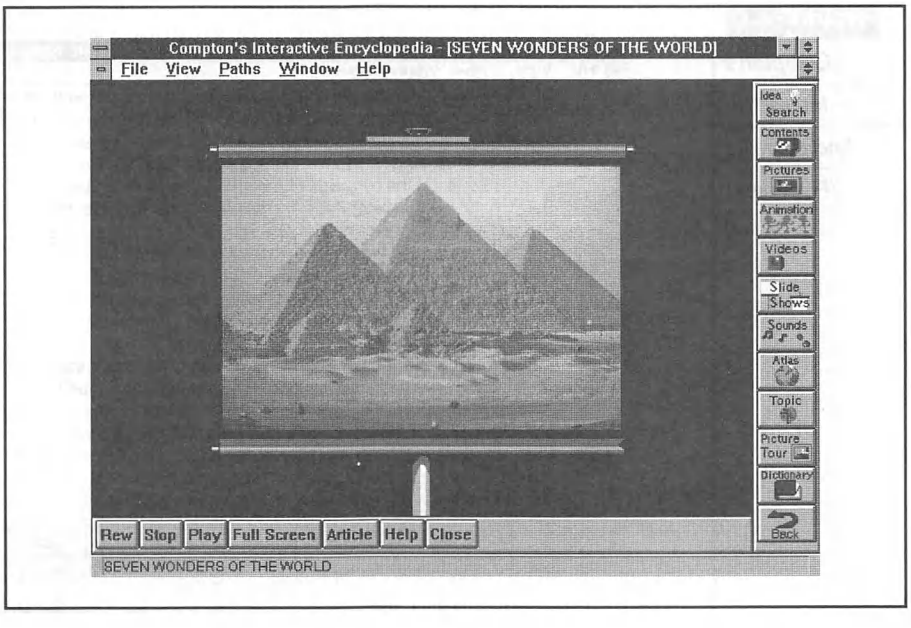
Interactive Encyclopedia by Compton's NewMedia

With a single CD-ROM, you can slide a 26-volume encyclopedia into your computer that'll make you addicted to having information at your fingertips. This Windows multimedia reference has everything you expect in a reference title: 9 million words in 33,000 articles; 13,000 images, maps, and graphs; 50 minutes of sound, music, and speech; 90 multimedia sequences, such as slide shows and animations; 5,000 charts and diagrams and the complete Merriam-Webster's OnLine Dictionary containing definitions of 60,000 words.

Your PC makes it easy to find information in an encyclopedia. Just type a name or subject, and the computer shows you all the possible topics. Once you've found the right topic, you're just a mouse click away from related pictures, video clips, diagrams, music, and speech samples. Figure 9-4 shows the opening scene of a slide show on the Seven Wonders of the World that is accompanied by music and the narrator's voice.

Interactive multimedia titles like this are full of *hyperlinks* that take you instantly to related information. Click the Article button and you see the

FIGURE 9-4 *Compton's Interactive Encyclopedia (Animation)*



related article, visible in Figure 9-5. The camera icon is a hyperlink that takes you to a photograph.

INSTALLATION/TROUBLESHOOTING If you can't get any of the videos or slide shows to work, check the Drivers applet in the Windows Control Panel to ensure that the MCI Microsoft Video for Windows driver is installed. If not, run SETUPVFW.EXE, which is in the root directory of the CD-ROM. If this isn't the problem, you may be running an out-of-date MSCDEX or video driver.

Version 1.01VW needs a software patch to work correctly with some video cards (such as ATI, Diamond, Orchid Fahrenheit, and others that share the same chip set). The symptom is a General Protection Fault error when you try to run the title or when you click Close after executing any function.

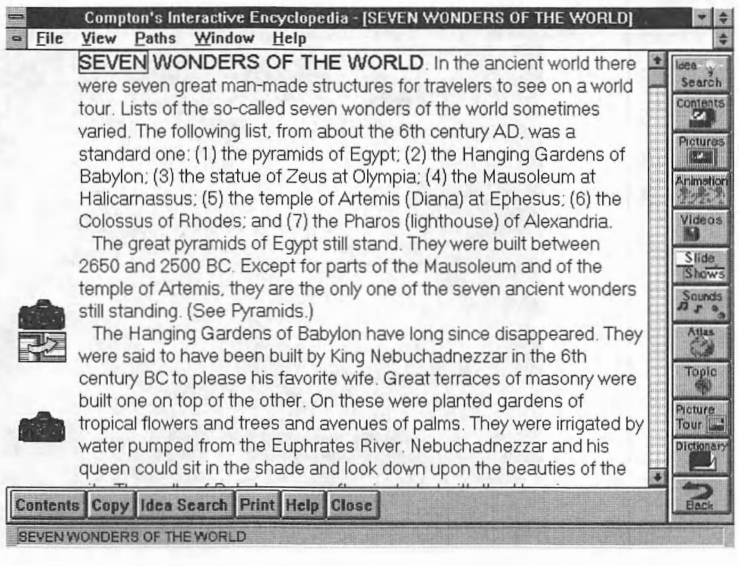
Entertainment Titles

Multimedia is beginning to mature, evident by the diversity of entertainment titles coming to market. There's everything from traditional shoot-em-up action games to mysteries sure to appeal to serious sleuths.

PC Karaoke by Sirius Publishing

PC Karaoke delivers endless hours of fun and entertainment that no other type of software can match. The whole family can sing along to the twelve

FIGURE 9-5 *Compton's Interactive Encyclopedia (Hyperlink)*



most requested karaoke songs. Using the title is a snap. Just click the picture associated with your favorite song, shown in Figure 9-6, and sing along. PC Karaoke puts the words on the screen and even helps you keep up with the tune by highlighting the word to sing.

Due to patented CD-S (Compact Disc Synchronization) technology, PC Karaoke does a great job synchronizing the lyrics to the music, so you always know exactly when to begin singing. This Microsoft Windows CD title has been awarded the Mondo Cool Award by Computer Shopper, and you can see and hear why.

The retail version of PC Karaoke bought at your local computer store includes a microphone, but if you receive PC Karaoke as part of a Media Vision Multimedia Upgrade Kit you have to obtain your own microphone (unless your kit includes the PowerPak software and microphone). Sirius Publishing, Inc., the source for PC Karaoke, sells both regular and reverb-style microphones, as well as additional song CDs. The microphones run from $49 to $99, and the song CDs are $15 each.



TIPS: *Click the bottom left panel to see a video clip of KJ, the outrageous Karaoke Jockey, who tells you all about PC Karaoke. Press* CTRL-V *and you can laugh at one of the KJ's 30 humorous routines.*

Tracks 2 through 13 are audio CD tracks that you can play on any audio CD player. To stop a song, press ESC *while the lyrics are displayed.*

FIGURE 9-6

PC Karaoke



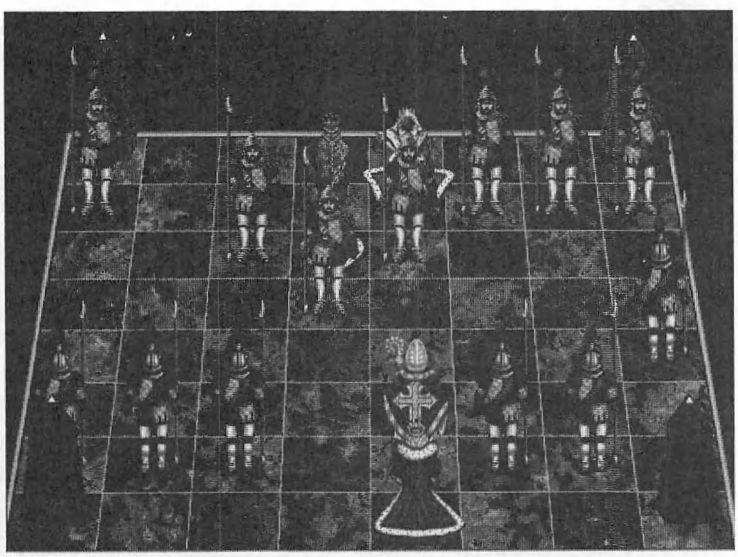
INSTALLATION/TROUBLESHOOTING If you're not using a 256-color video driver, the screen is unreadable. If the installation program suggests that the path should be modified, respond with "No" because this isn't necessary.

Battle Chess Enhanced CD-ROM by Interplay

Chess like this is never dull. Swords cross and sparks fly as the three-dimensional medieval-period pieces battle it out before your eyes. The Battle Chess Enhanced CD-ROM contains two nearly identical versions of this game (see Figure 9-7), one for DOS and the other for Microsoft Windows. You can set up the game for two people to play on one computer or, if you've got the guts to duel with the inhuman, you can play against your computer. A fun tutorial, loaded with music and voice, features the pieces introducing themselves and explaining how they move. Learning chess or polishing your skills has never been more fun.

A not-so-well-known feature of this game is that you can play chess with a friend over the telephone if you both have modems. Battle Chess contains all the communications software you need to connect two computers with compatible modems at 300 baud. The trick here is that both modems must be set for the same communications parameters, like number of bits and baud. Battle Chess does the rest. With the DOS product you access the phone number field by pressing F2, with the Windows product this feature is

FIGURE 9-7 *Battle Chess Enhanced CD-ROM*



apparent from the menus. When the phone number box appears, enter ATDT and then the phone number to dial.



TIPS: *Press ESC to skip the musical fanfare introduction. To activate the menus, move the mouse to the top of the screen. With the DOS version of Battle Chess, if the mouse is active, the keyboard is deactivated. When Battle Chess is set up to use the keyboard but not the mouse, you must press F1 to display the menus.*

If performance seems sluggish, switch from the three-dimensional chess board to the two-dimensional chess board. You can also turn off the fight scene animation to speed things up.

INSTALLATION/TROUBLESHOOTING Battle Chess works with 16-color video drivers but prefers a 256-color video driver. Don't be surprised if the voices are slightly out of synchronization with the animation.

One of the most frequent calls to Interplay is about finding the installation files, which aren't where most people expect them to be. You need to perform the following steps:

1. Switch to your CD drive (probably D: or E:).
2. Switch to the \CDCHESS directory.
3. Run the INSTALL program in that directory.

Once installed, DOS users frequently call Interplay technical support citing an out-of-memory error message. Battle Chess needs both conventional RAM and expanded memory, so make certain your system is set up to use expanded memory before calling Interplay.

There was a problem with an early Fusion CD 16 multimedia kit bundle. The CD-ROM drive proved too slow for revision four of Battle Chess. If you bought this kit, you're eligible for a no-fee exchange of your revision four CD-ROM disc for the revision three disc, which runs much better on a standard-speed CD-ROM drive. Contact Interplay's customer service department for help.

The 7th Guest by Trilobyte

You are the 7th guest to visit the crumbling mansion of Henry Stauf, which is now haunted by the terrible sing-song rhymes of children who died in mysterious circumstances after receiving Stauf's toys. Stauf himself has also met an untimely demise, leaving his secrets behind. The game begins when six guests are summoned to the late toymaker's hilltop mansion. Each of the 22 rooms has its own secret, and only you can solve the puzzle to end

the nightmare. Figure 9-8 shows one of the 22 rooms, with a ghost playing eerie music at the organ.

This CD-ROM title has been billed as the first interactive drama in a terrifying virtual reality environment. It's completely unlike any other computer game you've seen. Video clips of real actors and thousands of pictures of a real mansion were used to recreate a mansion within your computer. Use your mouse or joystick to "walk" through the rooms and look for clues. This game took the Consumer Electronics Show (CES) by storm. Bill Gates was quoted as saying, "This is the new standard for multimedia entertainment. This is the future." Be prepared to cringe in fear under your computer desk before you've solved the riddle.

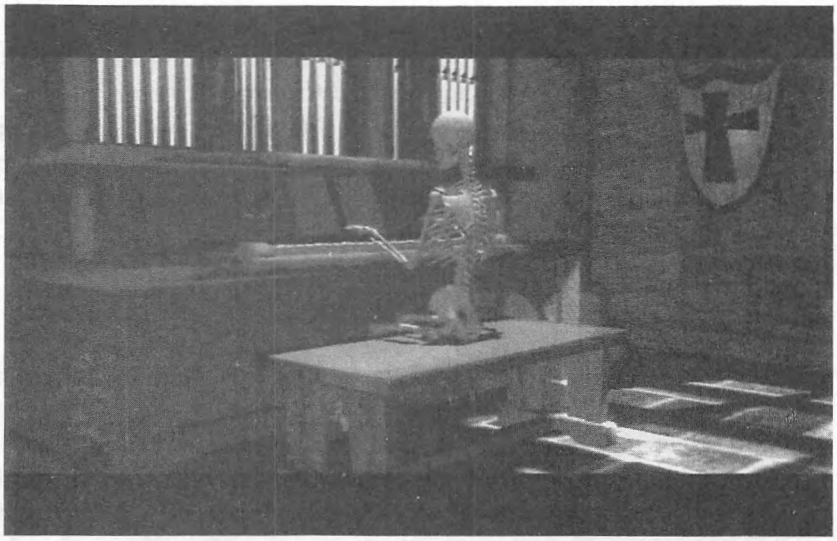
A sequel to 7th Guest called 11th Hour is due out by Christmas of 1993. Virgin Games also sells a title called Lands of Lure which is shipped on eight 3 1/2-inch disks for someone who'd like to experience interactive entertainment but lacks a CD-ROM drive.



TIPS: *This is an adult game—no sex, but potentially disturbing scenes of children dying—which would give this game a PG-13 if games were so rated. The puzzles are regular mystery puzzles and not computer game puzzles. If you need a bit of help, the mansion's library has books to assist you. The music was composed by "The Fat Man" of Wing Commander II fame, George Alistair Sanger, today's top composer of computer game music.*

FIGURE 9-8

The 7th Guest



INSTALLATION/TROUBLESHOOTING Note that 7th Guest must be run from DOS. If you've been running Microsoft Windows since the computer was turned on, you must reboot before playing 7th Guest. Rebooting is necessary to avoid a clash in sound drivers.

7th Guest requires a 256-color video driver. If you see "multiple hands" moving across the screen while using the mouse, contact your video card manufacturer for the latest VESA driver.

Several update disks are available. Update disk 1.30 (called V-Lite) runs 7th Guest with less base conventional memory. Update disk 1.24 takes care of a problem where customers using local bus video cards hear music but don't see the video.

Mantis Experimental Fighter by MicroProse

On March 16, 2094, the Sirians, a life-form from a dying planet, have launched a limited-scale nuclear attack on Earth, causing three billion casualties, as a prelude to moving their race to a new planet. The surviving people of Earth join together to resist the invaders and successfully counter-attack. A linchpin of the defensive strategy is the design and construction of the XF5700 one-person Mantis space fighter to protect Earth from further space-borne attacks. Your role—and the defense of Earth—requires that you become an expert at flying the XF5700 Mantis in mortal combat.

This is a classic shoot-em-up DOS computer game with engaging graphics and an entrancing story line. Before you fire up the game, loosen the screws that attach your joystick or mouse to the computer so it can be easily removed—in case the game ends with your hand in a deathgrip on the flight stick.

INSTALLATION AND TROUBLESHOOTING Most installation problems are due to selecting the incorrect DMA and IRQ when the program is installed. The Mantis setup program reads the correct DMA and IRQ from your computer, so you should accept these values.

The second biggest installation problem is due to the program needing 768K of expanded memory. If you lack expanded memory (use the DOS MEM command to check), you have to edit the memory manager in your CONFIG.SYS file. Mantis also needs a lot of conventional memory too, so you may have to unload nonessential TSR programs.

When installing, select the Pro AudioSpectrum choice for sound card. The game handles its own caching, so using a RAM disk or a CD-ROM cache doesn't improve performance.

Civilization (DOS) by MicroProse

You are anointed as the ruler for perpetuity of a civilization, beginning at the founding of the first cities six thousand years ago. You are challenged to build a civilization that survives the test of time, making the correct decision in dealing with trade, war, foreign intrigue, and disaster. As civilization develops, life becomes more complicated, and you move from fighting barbarians at your borders to dealing with global warming and nuclear meltdowns.

Civilization is one of the classic computer simulations, designed to fit on a floppy disk, so expect challenging game playing but not fancy graphics and music.



TIP: *You can speed through the introduction by pressing* SPACEBAR. *You can prematurely quit by pressing* ALT-Q, *but you may have to repeat this until it can be interrupted. If you'd like tips on the game, you can obtain a copy of Sid Meir's Guide to Civilization, published by Compute!.*

INSTALLATION/TROUBLESHOOTING If the game locks up when trying to change production, turn off the instant advice feature so it doesn't get overloaded.

Productivity Titles

There is only one title in this category, Macromedia Action!, which is a "best-of-its-breed" software tool for creating a presentation or self-running demonstration that features animation and sound.

Action! (Windows) by Macromedia

Action! Version 2.5 is the product to use when you need to grab your audience's attention. With Action! you can create a complete multimedia presentation—with sound effects, movement of graphics, charts, and text, and interactivity—with no prior experience in multimedia. For sound, you can add digital audio that you record, MIDI music, and CD audio. All of Action! is copied to your hard disk, so you can place an audio CD into your CD drive and serenade the audience with up to 72 minutes of orchestra-

quality music. Figure 9-9 shows a slide from a presentation with the Timeline displayed. The Timeline lets you control the precise timing of every event, including audio events.

Here's a fun exercise to add your own voice-over to a presentation. Either use an existing Wave (.WAV) file or create a short voice-over with Pocket Recorder or your favorite recording tool. Now run the sample presentation that comes with Action! until you've reached a scene where you'd like to add your voice. From the Tool Palette click the Sound tool (Speaker button). Using the mouse, position the cursor (now a miniature speaker icon) on the object you wish to add sound to. Any object will do, including the background. When you click the mouse, a Sound Import dialog box appears. Select the Wave file and click the Import button. Now the Sound Edit dialog box appears. Click OK. Rewind and play again and hear your Wave file play at the appropriate step in the presentation. Adding audio CD or MIDI music is just as easy. (Note that the mixer must be set to Record.)



TIP: *Press* ESC *to stop the presentation playback.*

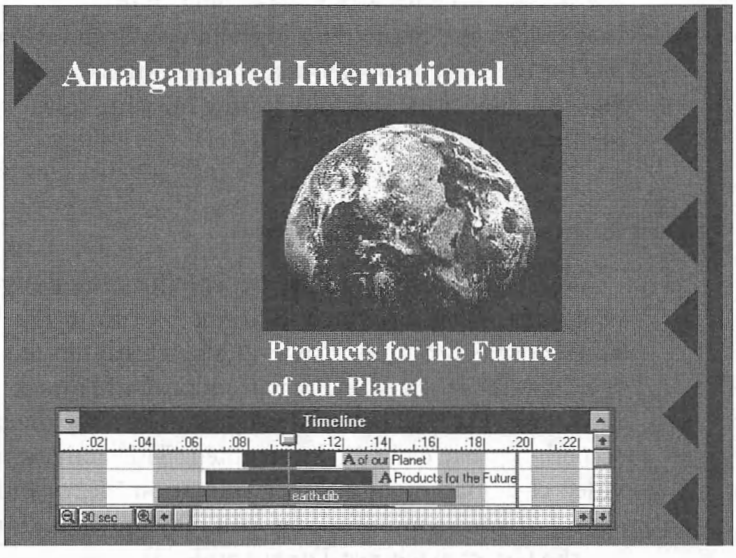


FIGURE 9-9
Macromedia Action!

GETTING THE BEST PERFORMANCE FROM YOUR CD-ROM TITLES

Multimedia CDs provide whizbang features you don't get with floppy-disk-style software. You get loads of digitized sound, audio CD music, and hyperlinks that let you jump with just a mouse click between related topics in a reference title like Compton's Interactive Encyclopedia. If you're new to CD-ROM multimedia, the following dos, don'ts, and can'ts set your mind at ease when wondering whether you're doing something wrong or whether your PC is acting a little strange.

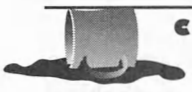
What to Expect in Performance

As an early adopter of new technology, you're bound to experience both the excitement of new technology and a few rough spots. IBM-PC-compatible computer hardware—as well as the CD-ROM hardware—don't yet have the horsepower for smooth-running multimedia. Frequently you'll notice that words you hear aren't quite in synchronization with the words or the picture on the screen. Another rough spot is that the video clips (short video movies) appear in a small window on your screen, and are low-resolution (grainy) images.

Multitasking or the Lack Thereof

With Microsoft Windows (in enhanced mode) you can switch between programs, some of which continue to run in the background, such as a printer or fax program. However, there are limits to multitasking. Frequently you can't do anything in the current program ("task" in Windows parlance), or you can't switch between programs, because the multimedia title is doing something that can't be interrupted. This activity may be the display of a video clip, loading of another animation file, or pulling in more audio CD sound. If you're multitasking, you may notice performance problems on all but the fastest machines. For example, suppose you have PC Karaoke playing sound tracks while you're typing away in a word processor. Every time PC Karaoke goes to fetch another song from the CD-ROM, you discover your

keystrokes are disappearing into outer space. Suddenly, when the CD drive light stops blinking, the keystrokes spurt onto the screen. There's no point in fighting this. When you hear a sound track coming to an end, it's a good time to relax and enjoy the start of the next song.



CAUTION: *If you're getting impatient with your CD-ROM title and you're contemplating pushing the reset button, be sure to take a peek at the CD-ROM drive busy-light first. Multimedia titles often load data from the disc in long gulps. This is done so that the animation sequence flows smoothly once it starts. Don't even begin to consider doing anything drastic until the busy-light has been off for several seconds.*

How to Cut the Action

Multimedia producers love to show off their musical and animation talents with long fanfares at the beginning of the title. Fortunately, you can usually skip through these by pressing a key, usually SPACEBAR or ESC.

While running a title, you may want to quit before a sequence ends. The appropriate key varies from title to title, but try the following in this order: ESC, SPACEBAR, ALT-Q, and CTRL-Q. Frequently the CD-ROM title is too busy handling music or video to be bothered, so you have to wait until it's your turn to interact.

Listening to CD-ROMs on Your Audio CD Player

CD-ROM discs have so much capacity that multimedia producers can't resist stuffing the CD-ROM with their favorite music, even if it isn't necessary for the CD-ROM title. The first track contains data needed for running the software. However, as long as the remaining tracks contain Red Book (CD) audio, they can be played in audio CD players. Give 7th Guest (disc two) and PC Karaoke a whirl in your audio CD player.



TIP: *You can't use the DOS DIR command or the Windows File Manager to see the contents of an audio CD disc since there isn't a file directory. If you do try to use DOS DIR, you'll recieve a "CDR 101" or "CDR 103" error message.*

Speeding Up Performance

The more beautiful and melodious the CD-ROM title, the more it demands from your computer. Multimedia needs a lot of your computer's horsepower, so you may need to tune your system for the best possible performance.

Boosting or Tuning the Hardware

If you run Microsoft Windows CD-ROM titles, you can improve the performance by throwing more memory into the fray. Windows loves memory. Taking your machine from 2MB of RAM memory to 4MB or, better yet, to 8MB gives you a big jump in performance.

You can speed up the drawing of screen images by installing a faster video card, preferably a Windows accelerator card that's optimized for graphical programs like Windows.

You may also be able to improve the video performance of your existing video card by obtaining a more up-to-date software driver. Contact your computer store or the video manufacturer to see if there's an update.

Minimize Special Effects

Many CD-ROM titles offer you a choice of presentation options. For example, Battle Chess lets you display either a two- or three-dimensional chess board. The two-dimensional chess board is simpler and faster to redraw. In addition, you can speed the game by suppressing the battle scenes.

Moving Files from the CD-ROM to the Hard Disk

If your hard disk is as unpopulated as northern Alaska, then you can improve performance by copying animation and sound files from the CD-ROM to the hard disk. Data is read from the hard disk up to ten times faster than from the CD-ROM. The setup program for CD-ROM titles suggests files that can be optionally copied to your hard disk to improve performance.

Dealing with the Dreaded Disk Dilemma: Out of Space

It seemed like just yesterday that a 200MB hard disk could gobble anything thrown at it, but with so many bargains to be had in software today, those 200 megabytes disappear quickly. Once you add a CD-ROM to your computer, you're in for a tighter squeeze. According to a recent study, the average person buys 12 CD-ROM titles. Most CD-ROM titles can survive on a relatively small ration of hard disk space, anywhere from 50KB to 1.5MB, yet many of these titles can easily chew up another 10, 20, or even 30 megabytes of disk space if you're willing to sacrifice disk space for faster performance.

There are several ways to approach the disk space dilemma. One is to use disk-doubling software such as Stacker or Microsoft's DoubleSpace. These

software drivers approximately double your disk capacity by storing data in a compressed form and automatically decompressing the file when it's read from disk. Two other approaches are discussed next: selective compression of directories and periodically cleaning out the \TEMP directory.



NOTE: *It's hard to predict the impact that compression schemes like this may have on your computer's performance. Your CPU must labor to handle file compression and decompression, yet the data is pulled off the hard disk more quickly. Also, note that information read from the CD-ROM does not get put into the same cache that's used for your hard disk, such as SmartDrive. See Chapter 11, "A CD-ROM Compendium," for more details.*

Selective Compression

An alternative solution is to selectively compress CD-ROM software that you rarely use. For example, once you're tired of playing with a game, rather than scrub it from the disk you can compress everything in the directory. This frees about 50 percent to 90 percent of the room formerly occupied. When you're ready to play again, you can restore the original files in no time at all. Inexpensive compression software for archival purposes, like the shareware programs PKZIP and LHARC, compress or decompress an entire directory in a single command.



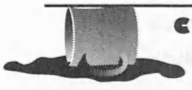
NOTE: *Archival compression software like PKZIP and LHARC preserve and later restore your disk file without any loss of information. Chapter 5 discusses another type of compression, ADPCM compression for audio, which shrinks a sound file but causes audio quality to be lost in the process.*

Once you've become familiar with your sound card, an ideal candidate for compression is the QUICK subdirectory where the Quick Tour introduction to Pro AudioStudio and the more recent multimedia upgrade kits are located. For example, if you have Pro AudioStudio 16, the tutorial is found in \PASTUDIO\QUICK. With PKZIP the contents of this directory can be reduced by more than half, saving 1MB of disk space, without erasing any files. Quick Tour is unavailable for Pro AudioSpectrum 16 or the earlier sound cards and multimedia kits.

Clearing Out the TEMP Directory

It's advisable to periodically delete files left over in the \TEMP directory. When running software, especially Microsoft Windows software, temporary

files are often placed in a directory called \TEMP. When an application finishes, it usually deletes the temporary files it created. Sometimes this doesn't happen and files are left as orphans in the \TEMP directory, stealing valuable disk space. This frequently happens when you have to reboot Windows because a program hung. After using one of the titles featured in this chapter, the authors discovered a 4-1/2MB temporary file lounging around in the \TEMP directory.



CAUTION: *Under no circumstances should you delete temporary files in use—this is a surefire method for crashing programs. It's best to delete files from the \TEMP directory after you've exited Windows and returned to DOS. (This is not the same as selecting the DOS Icon.) If you insist on deleting temporary files while working in Windows, first close all tasks other than the File Manager.*

CD-ROM TITLE TROUBLE-SHOOTING

This section addresses two related problem areas that you may run into: you can't get the setup or installation program to run correctly, or it seemed to run but your multimedia title doesn't play properly. This section assumes that your CD-ROM drive is known to be in working condition, because you've already played another CD-ROM or audio CD, but now you're having a problem with a specific multimedia title.

If you don't see the answer here, or in the section titled "Getting the Best Performance from Your CD-ROM Titles," examine Chapter 11. It contains information on selecting and installing a CD-ROM drive, including software driver configuration and troubleshooting CD-ROM hardware problems.



TIP: *While it's relatively easy to get through to the technical support personnel at Media Vision, they aren't the authors or the experts on the software described in this chapter. Contact Media Vision if you've already worked your way through Chapter 11 and concluded that you have a hardware problem. Otherwise, contact the publisher of the software directly. These folks are often very hard to reach, so you may want to seek help through their bulletin board service (BBS) or through their technical support forum on a major information service such as CompuServe or America Online. You can leave a message on these services and pick up a response in a day or two. See Appendix D, "Resources," for more details.*

Problems Common to Both DOS and Windows Multimedia Titles

The following issues and problem areas are common to multimedia titles running under either DOS or Microsoft Windows.

Video Palette or Video Driver Error Message

If you receive an error message about a video driver or video palette, you may need a 256-color video driver. Most Microsoft Windows-capable computers sold today have a 256-color video driver. However, older computers with VGA displays may have a 16-color video driver installed. The MPC Level 1 standard recommends a 256-color video driver but stipulates that the title must run on 16 colors. Many of the titles reviewed here, such as Arthur's Teacher Trouble, claim to be MPC-compliant yet refuse to run with a 16-color driver! If you try a multimedia title and get a cryptic message about the video pallete or video driver, this is the problem. Contact your computer store or video card manufacturer for a 256-color driver. Even if you don't have to use a 256-color driver, it's highly recommended because the titles are more attractive with 256 color choices. You need at least one-half megabyte on your video card to run with 256 colors. To find out whether you have a 256-color video driver, run the Windows Setup applet in the Main program group and see the description there for the display driver.

You Can See the Picture but Can't Hear Anything

This is the most common complaint. Your title seemed to install correctly, but when you play it, you see pictures and hear no sound from the CD. Chances are you can hear the FM-synthesized music and digital audio voices and special effects, but not audio CD music.

Try to play an audio CD with Music Box or Pocket CD. If you can hear the audio, your hardware is working. If you can't hear any audio, then bring up a mixer and make certain that the audio CD source as well as the master source are set at least halfway up. If you're still having problems, you probably have a driver or audio cable problem.



TIP: *When troubleshooting for a lack of audio, be aware that a CD-ROM disc can contain three distinct types of audio: MIDI music, digital audio, and Red Book audio (CD audio). These are independently controlled by the mixer. To be cautious, turn up all your source volumes as well as the master volume control when you're testing.*

DOS TITLES ONLY If you still can't hear anything, you're having a driver problem or the audio cable that runs from the CD-ROM drive to your sound card's internal CD audio connector is not attached properly. Refer to Chapters 3 and 11 for further assistance on drivers and connectors, respectively.

MICROSOFT WINDOWS TITLES ONLY If this is the *first* time you've tried a CD-ROM title, and you can't hear CD audio, you probably lack the [MCI]CD AUDIO driver. Go to the Main window, select the Control Panel, and then double-click the Drivers applet. You need to see [MCI]CD AUDIO in this list to hear CD audio. Please refer to Chapters 3 and 11 for further assistance.

Select Pro AudioSpectrum for Your Sound Card

The second most common installation problem is selection of the wrong sound card. Generally, you should select a sound driver that's called Pro AudioSpectrum or something similar. Occasionally, the software instructions tell you to select Sound Blaster—the case when you're running a game in Sound Blaster-compatibility mode—but don't select this unless you're told to do so.

A Windows-Specific Multimedia Title Problem

The following problem is specific to Windows multimedia titles.

Installation Fails Under Microsoft Windows

You're trying to install a Microsoft Windows MPC multimedia title, but the installation visibly fails or you suspect it didn't do the complete job. Many CD-ROM installation programs assume that they are running under Window's Program Manager. If you try to install under Norton Desktop, PC Tools, or another shell program, the install program may fail. If this occurs, quit your shell program and try to install again, using the Windows Program Manager.

DOS-Specific Title Problems

The following problems are specific to DOS multimedia titles.

Insufficient Memory Error Message

Sometimes the installation fails with a message that there isn't enough memory. Many DOS multimedia titles are memory hogs. They want it all—lots of conventional RAM memory plus expanded memory. You need a memory manager to make these beasts happy. To free up conventional memory you may be forced to remove items like SMARTDRV.SYS (needed for speeding disk access by Windows applications) or SHARE.EXE, which is used for database and network applications. Use the DOS MEM command to find out how much memory, conventional and expanded, you currently have. To make expanded memory available you may have to edit the memory manager in your CONFIG.SYS file. See your DOS manual and Chapter 3 for more details.

Problems Running DOS Titles Under Microsoft Windows

Windows users should generally avoid trying to run DOS CD-ROM titles or DOS games in the DOS compatibility box of Windows. It rarely works, and will usually hang your system. The *DOS compatibility box* is the DOS window, with the DOS C> prompt showing, that you get after selecting the MS-DOS Prompt icon in the Main window. To run a DOS title, quit Windows by selecting Exit Windows from the Program Manager.

THE SOFTWARE PUBLISHERS

Listed here are the addresses and phone numbers of the publishers whose products are described in this chapter:

Brøderbund
500 Redwood Boulevard
Novato, CA 94948-6121
(415) 382-4600 (Corporate Office)
(415) 382-4700 (Technical Support)

Compton's NewMedia
2320 Camino Vida Roble
Carlsbad, CA 92009
(619) 929-2500 (Corporate Office)
(619) 929-2600 (Customer Service Fax)
(619) 929-2577 (Sales Fax)
(619) 929-2626 (Technical Support)

Interplay
17922 Fitch Avenue
Irvine, CA 92714
(800) 736-5738 (Sales)
(714) 553-6655 (Technical Support)

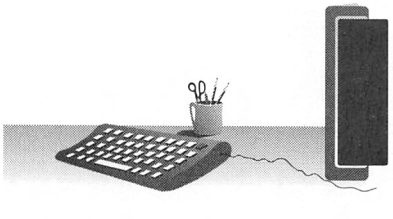
Macromedia, Inc.
600 Townsend Street
San Francisco, CA 94103
(800) 288-4797 (Sales)
(415) 252-2000 (Corporate Office)
(415) 252-9080 (Technical Support)

MicroProse
1801 Lakefront Drive
Hunt Valley, MD 21030-2245
(410) 771-1151 (Customer Service and Technical Support)

Sirius Publishing, Inc.
7320 East Butherus Drive - Suite 100
Scottsdale, AZ 85260
(800) 247-0307 (Sales)
(602) 951-3288 (Corporate Office)
(602) 951-3884 (Fax)

Sony (Distributor for Interactive Ventures, Inc.'s Mayo Clinic Family Health Book)
(310) 449-2320 (Technical Support)
Contact Interactive Ventures, Inc. with sales and written technical support questions:
Interactive Ventures, Inc.
2900 Lone Oak Parkway
Eagan, MN 55121
(612) 686-0779 (Sales)
(800) 692-4000 (Phone orders only)

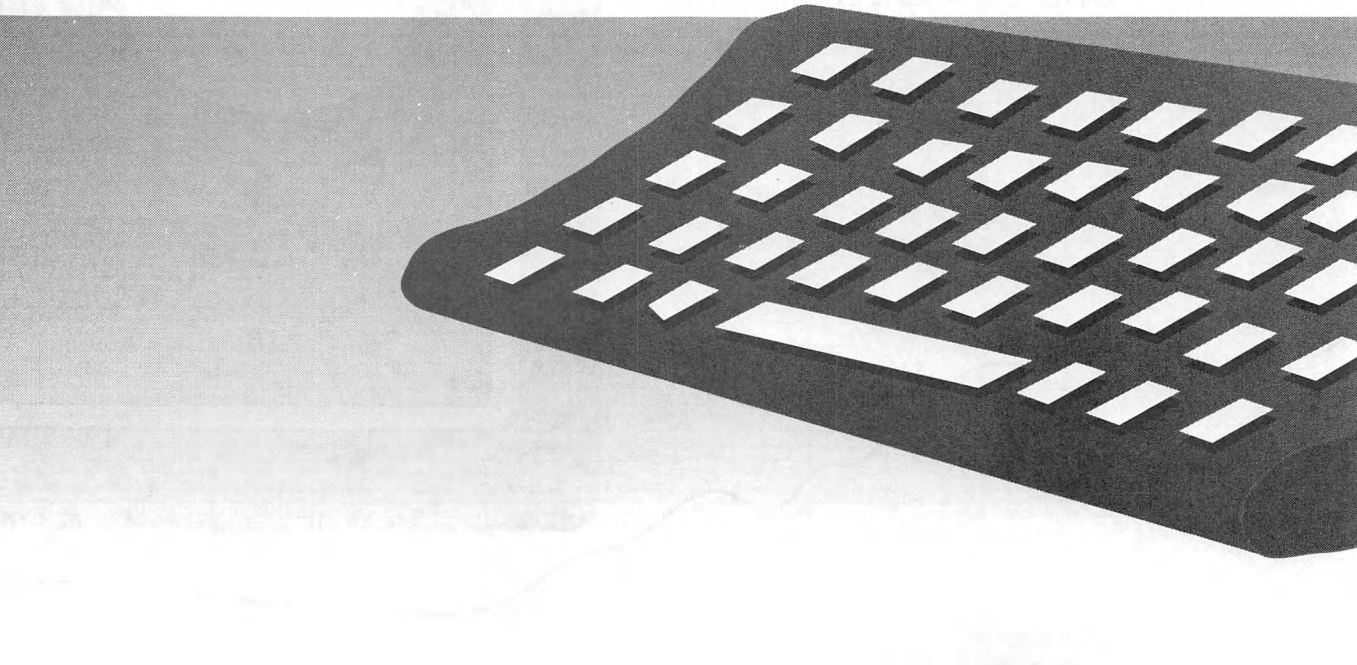
Virgin Games, Inc. (Distributor for Trilobyte, Inc.'s 7th Guest)
18061 Fitch Avenue
Irvine, CA 92714
(800) 874-4607 (Sales)
(714) 833-1999 (Technical Support & Customer Service)

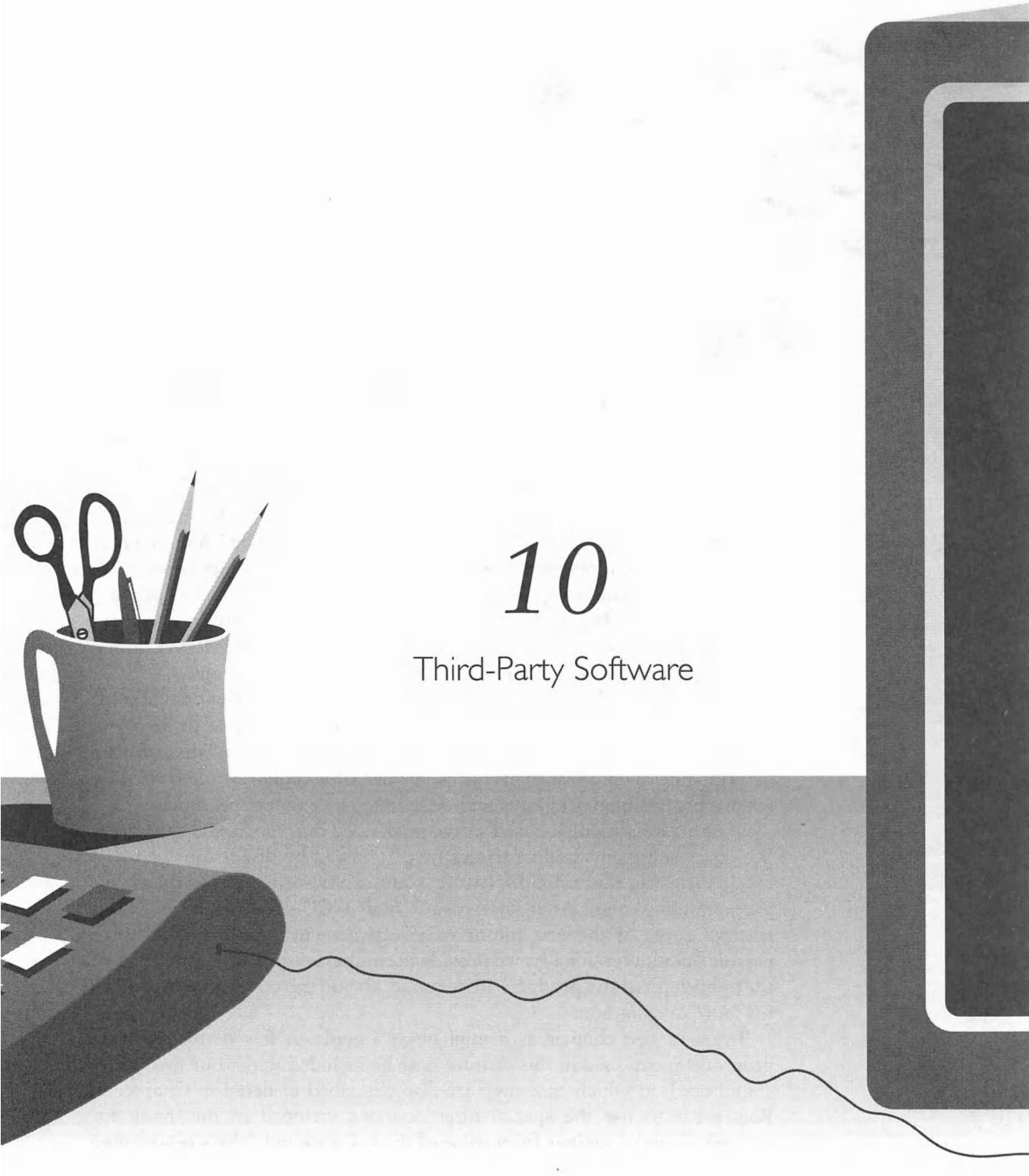


IV

Third-Party Software and Hardware Enhancements

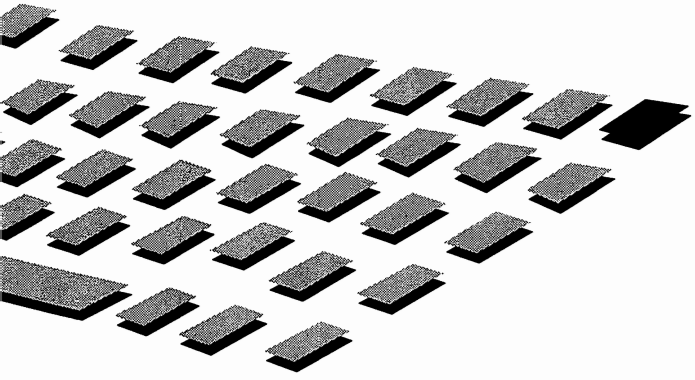






10

Third-Party Software



SOUND, or the lack of it, traditionally has been one of the few weak areas of the DOS PC. With a PAS sound card, PC users can get great music and sound effects from their software. By virtue of its Sound Blaster compatibility and its wide acceptance as the premier 16-bit sound card, the PAS sound card is supported by virtually every software publisher. In fact, almost all contemporary PC game software supports the PAS sound cards.

Because Media Vision provides Windows drivers for the PAS, all multimedia Windows applications can automatically take advantage of the PAS. The popularity and acceptance of the Windows environment has brought about a shift in software development. As Windows becomes the dominant desktop interface on PCs and new multimedia titles are developed, sound becomes an increasingly important addition to the PC status quo.

Following is a selected list (it is by no means a comprehensive one) of some of the best tools, applications, utilities, and games available to help you maximize your investment in your PAS sound card. Some of the software described below are just plain fun, some are educational, while others are serious professional programs with matching professional price tags.

We start off with disk-based software, divided into functional categories. We cover some outstanding games first, followed by discussions of MIDI music software, educational software, some utility software, and then some programming tools. After that, you'll find a CD–ROM section, which features some of the best multimedia software currently available for a personal computer. Finally, we provide the addresses and phone numbers of the publishers whose products are featured, so you can contact them directly for more information.

Think of this chapter as a mini buyer's guide. A few of the software programs mentioned in this chapter may be included with your Pro Audio sound card, in which case they are also described in detail in Chapter 9. Remember to use the special offer coupons included in this book for exclusive, special savings from some of the software publishers represented in this chapter.



NOTE: *Just because we didn't include a certain program in this chapter doesn't mean it is not good. The ones we do write about represent some of the best titles we've personally encountered. With the multitude of software available, if would be no surprise if we missed some.*

Remember, you don't have to pay retail prices for software. You will find that software is regularly discounted from 10 to 50 percent. Purchase software from a store that has a money-back guarantee when possible. That way, you won't be stuck with software that doesn't have the features you're looking for. Also check to make sure you've got the latest version—software updates occur so frequently that many stores may still have older versions of the software on the shelf. Call the software publisher to find out about later versions.

Happy hunting.

GAMES GALORE

Not surprisingly, some of the most sophisticated uses of sound cards and multimedia technology can be found in games. Besides CAD (Computer Aided Design), few applications require more computing power than games. Just look at a typical modern flight simulator like Falcon 3.0 as an example. At any given moment, the computer has to: track where your aircraft is in a 3-dimensional environment; update all the instruments on the instrument panel; update the outside view; keep track of other airplanes, ground vehicles, and missiles; play appropriate sounds such as the engine or radio communications; update the radar system; read the input from your keyboard, joystick, and/or mouse; and countless other details. A spreadsheet or word processor couldn't keep a computer this busy.

Since there is a seemingly unending number of games, we've tried to narrow the list down to those that make exceptional use of your Pro Audio sound card and those on the cutting edge. The section is divided into various game categories. We do not go into very much detail on the individual games themselves due to length considerations.

We have played many, many games ourselves, and the games that we mention here have left an indelible impression in our minds and have entertained us for many hours.



NOTE: *Retail prices are not included in our survey of games. However, retail prices for these games pretty much fall into the $50 to $90 range.*

Simulations

Simulators are programs or games that attempt to model aircrafts, automobiles, or vehicles realistically on the PC. They allow a PC user to experience the thrill of actually being in the cockpit of an airplane or the driver's seat of a formula-one race car.

Simulations—flight simulators in particular—are probably some of the most sophisticated software ever written for a PC. This area shows a lot of maturity, as some software programs are in their fourth or fifth incarnations. In fact, a whole cottage industry, providing sophisticated aircraft controls and the like, has emerged from the enthusiasm of this group of gamers.

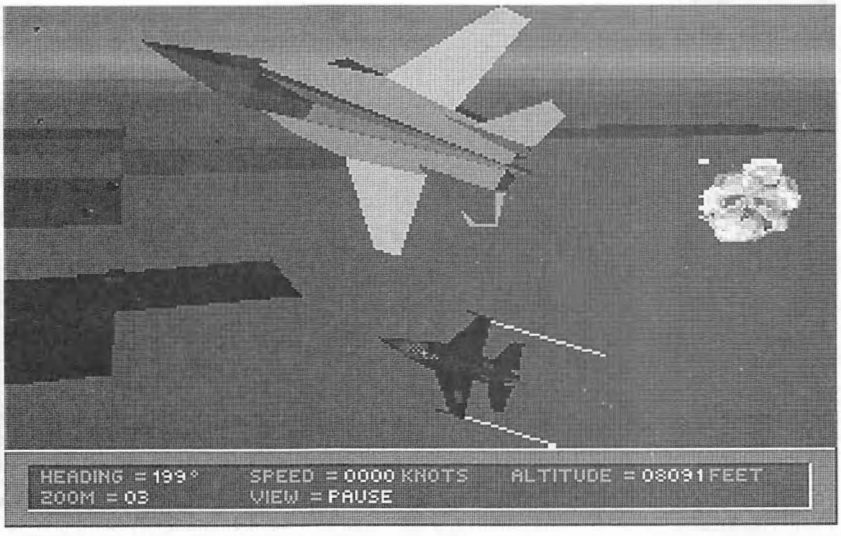
If your preference leans towards the days of old, when you saw the whites of your opponent's eyes as you shot them down, look no further than Red Baron, by Dynamix. Red Baron accurately portrays the flight characteristics of World War I aircraft, with vivid engine and machine gun sounds. Dynamix continues to establish a tradition of excellence with the follow-up to Red Baron, Aces of the Pacific. This simulator recreates the American and Japanese aircraft flown in the Pacific Theater in World War II. One of the highlights is the distinctive engine sounds for each aircraft—the drone of the twin-engine P-38 Lightning is louder and certainly different than the drone from a P-51 Mustang. Aces Over Europe (unavailable at press time) is touted to be even more accurate and stunning, and the previews looked and sounded excellent.

Modern-day jet simulators sport some stunning sound effects, including speech. Spectrum Holobyte's Falcon 3.0 (Figure 10-1) is a perennial favorite and best-seller (with over 100,000 registered copies) for good reason. The flight characteristics are accurate and can be set to various levels of difficulty. Not only do you get all the regular sounds such as missile lock tone, your wingman actually responds and talks to you. The MiG-29 add-on even has co-pilots complete with Russian accents. An expansive mission generator rounds out this standard, to which every jet combat simulator is compared.

Microprose's F-15 Strike Eagle III has a great introduction. The programmers paid close attention to programming the sound effects, and this attention to detail shows: Explosions that are closer are louder, and the engine becomes louder when you zoom in on the external view. The various radar modes can be bewildering, just like the real thing. The sky is absolutely gorgeous, but it is devoid of wingmen, a notable omission.

FIGURE 10-1

Falcon 3.0 by Spectrum Holobyte



Origin's Strike Commander arguably has the best external view of any flight simulator. Every plane is rendered in camouflage paint and is shaded—a level of detail unheard of on PCs before Strike Commander. Also, each wingman has a distinctive voice (with the optional Speech Pack) over the radio, and you do get to listen to your mortal enemies scream as your missile destroys their airplanes. However, these lavish details have a negative effect on Strike Commander, as it runs at a snail's pace on anything other than a 486/66 MHz computer. You can lower the detail level, which will improve the speed somewhat, but which will also detract from the game's beautiful scenery.

Microsoft Flight Simulator 5.0 (Figure 10-2) is relatively boring compared to the combat-oriented flight simulators we've discussed earlier. However, the fact remains that it is probably the most accurate of all flight simulators, and the graphics are the best of its genre. It is the only game that runs in high-resolution mode with 256 colors and uses actual satellite photos, providing the sharpest and most realistic views ever seen on the PC. You also can't do better than sounds taken from recordings of actual aircraft. This game should be on everybody's computer, whether you're a flight enthusiast or not. Flying around San Francisco at dusk turned our mouths into Venus flytraps as we gaped at the stunning scenery displayed before us on the screen.

Another simulation that makes great use of sound is Nova Logic's Comanche: Maximum Overkill. This futuristic helicopter simulation has stereo sound effects as well as different sounds for its many weapons.

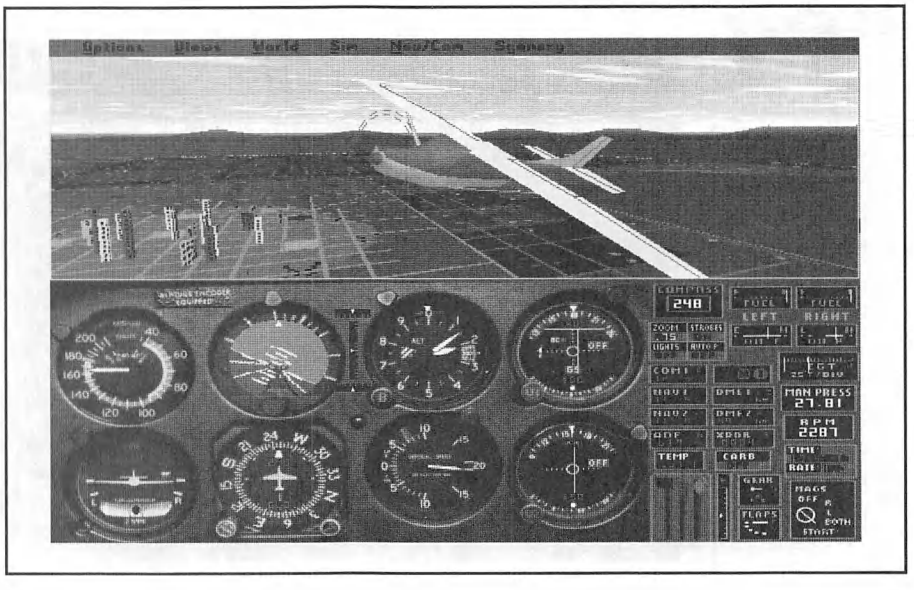


FIGURE 10-2
Microsoft Flight Simulator 5.0

The graphics are excellent, and because it's based on a future helicopter design, the simulator is very easy to control, compared to traditional helicopters both in real life and on the computer.

While not strictly a realistic simulator, X-Wing from LucasArts allows you to enter the *Star Wars* world. You join the Rebellion forces and pilot a variety of spacecraft—the A-Wing, X-Wing, and Y-Wing—in several dozen missions. It is amazing how much the sound effects are exactly like those in the *Star Wars* movies. You can even hear the whistles and beeps of your very own R2 unit. Be forewarned: Even if you are just a minor *Star Wars* fan, X-Wing will have you staying up late, shooting at Darth Vader's fleet of TIE Fighters to get to the Death Star trench.

Action

Action games abound in the world of Nintendo and Sega game machines. In the PC world, fewer such games exist. However, the quality of action games on the PC easily surpasses most of what is offered on the dedicated game machines. Among them is Interplay's Out Of This World and SSI's Flashback. Both games, programmed by the same French company, make extensive use of digital sound effects on your Pro Audio sound card.

Id Software's Wolfenstein 3-D is a highly successful, well-executed action game that features smooth scrolling graphics and good sound to accompany the carnage. You can hear Nazi soldiers yelling at you, machine guns rattling, dogs barking, and sliding metal doors, along with numerous other sounds.

Brøderbund's Prince of Persia 2 features speech-enhanced animated scenes with great graphics and sound effects. The smooth animation is accurately synchronized with the sound, adding a great deal to the game. You can hear opening and closing gates, the clashing of swords, and the screams of the "Don King heads" (monsters).

Adventure

Adventure games are a very popular game category. The current games in this genre usually feature a full soundtrack that plays throughout the game in addition to numerous sound effects. Probably the most prestigious game of this kind is the King's Quest series from Sierra On-Line. King's Quest VI continues to break new ground in this category with a lip-synching technology that synchronizes the voice with the movement of the character's mouth. King's Quest VI is also designed to be extremely flexible, allowing the beginner to complete the game by solving only 40 percent of the problems presented in the game.

The Monkey Island series from LucasArts is not only funny and thoroughly enjoyable, but the music soundtrack is some of the best Caribbean/reggae music this side of the computer screen. Both Monkey Island 2 and Indiana Jones: Fate of Atlantis (Figure 10-3) feature their innovative iMuse sound system, which provides smooth transitions between different tunes as well as distinctive tunes for each character in the game. The graphics for both games are wonderfully done, and the stories are top-notch (in fact, Fate of Atlantis would make an excellent Indiana Jones movie).

Alone in the Dark from I-Motion is a European import that successfully blends an interesting storyline with some innovative camera angles. You explore a haunted house full of ghosts and monsters. The animation is smooth, and the sound is just plain spooky. You hear sounds of creaking floorboards, a shotgun being fired and recocked, eerie moans and groans, and the clashing of swords.

Sports

LinksPro 386 (Figure 10-4) from Access Software is a standout product in the sports category. This is the best looking golf game available for the PC, bar none. Not only are the graphics eye-popping (the foliage is digitized from the actual course), the whole course is meticulously recreated with the help of video footage, photographs, actual playing time, and course architect plans and designs. During your rounds at a variety of golf courses, you hear birds chirping right before the swoosh of your golf club as you swing. Short commentary, such as "Looks like you hit the tree, Jim," do little for your

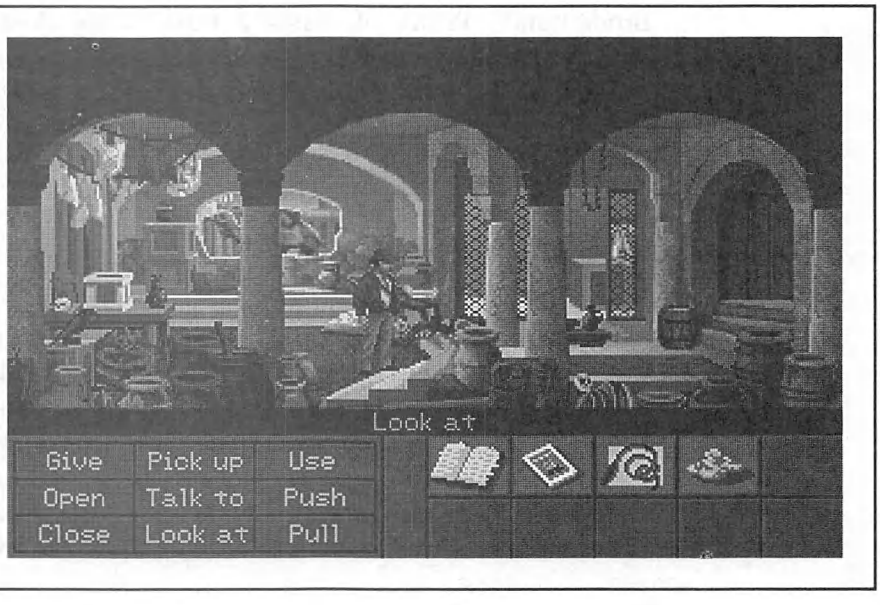


FIGURE 10-3 *Indiana Jones: The Fate of Atlantis by LucasArts*

nerves as you prepare for your next shot. You can select either a male or female golfer and you can customize the shirt color. The comments are also made with the appropriate male or female voice.

Front Page Sports: Football Pro from Dynamix is about the best blend of action and statistics you'll find in a PC football game. Dynamix has a license

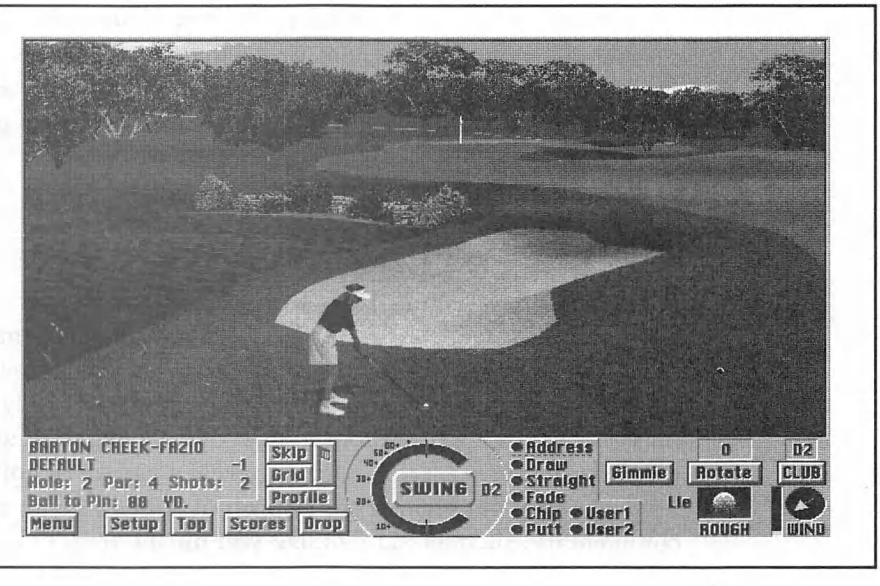


FIGURE 10-4 *LinksPro 386 by Access Software*

to use the names of actual NFL players with their corresponding statistics, so you can place some of your favorite players into action. You get to hear the snap count and audible calls from the quarterback ("red forty-twooo...red forty-twooo...hut-hut"), as well as the cheering (or booing) crowd and the crunch of players colliding.

The unmistakable voice and style of Al Michaels can be heard in Hardball III from Accolade, as he provides running commentary for the baseball game in progress. Though the spoken sentences are sometimes choppy, the crack of the bat and the cheer of the crowd as you hit one out of the ball park gets your adrenaline flowing. The game even starts with the traditional national anthem.

Strategy

While admittedly we're not strategy game players, we couldn't resist Buzz Aldrin's Race Into Space (Figure 10-5) from Interplay. This game pits you against either the Russians or Americans as you try to build your space program beginning in 1957. The goal is to be first to put an astronout on the moon and bring him back safely. You have to manage your R & D (research and development) dollars, select and train astronauts, and purchase equipment. During the missions, you see actual footage from various rocket launches while listening to actual recordings of communications

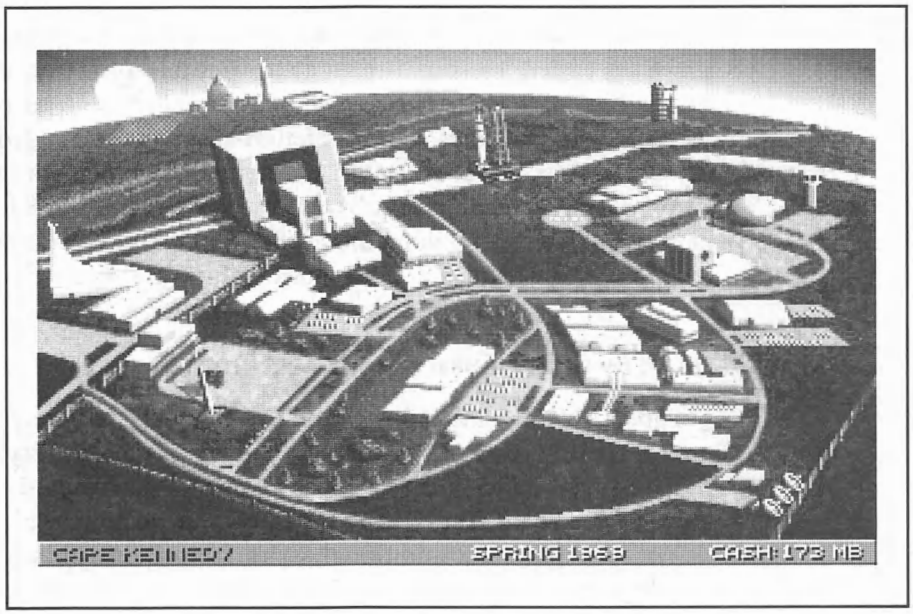


FIGURE 10-5 *Buzz Aldrin's Race Into Space by Interplay*

between astronauts and ground control. You'll be watching with great anticipation as a Titan rocket blasts off, waiting to see if it makes it into orbit or explodes after launch due to a malfunction. You can honestly say you know what it feels like to watch the real thing in Mission Control.

MUSIC AND MIDI MAGIC

Computers are commonly called upon to supplement and perfect the modern musician's art. The software programs used by professionals to control their MIDI systems are now readily available to everyone. Simpler systems are also available, allowing the uninitiated to enter the MIDI music world and explore their musical inclinations.



TIP: *Refer to Chapter 8 for a detailed discussion of MIDI technology.*

Since the Pro Audio sound card behaves like a MIDI component, all the software programs described in this section can work correctly with the Pro Audio sound card. To take full advantage of all the capabilities of MIDI software, you really should have a professional musical keyboard or sound module, and not just the FM synthesizer found in your Pro Audio sound card. If you're one of the lucky owners of a Pro AudioStudio 16XL with the Korg wavetable synthesizer, you should hear some stunning music from these software programs.

The following is a sampling of some professional-grade MIDI software as well as easier, less-sophisticated incarnations for the beginners among us. You'll find various MIDI sequencers that allow you to compose or edit music. We also include a couple of auto-accompaniment programs for those of you who may know how to play one instrument but not others; these auto-accompaniment programs play the other instruments for you while you play the instrument of your choice. Several notation programs allow you to compose music using standard music notation.

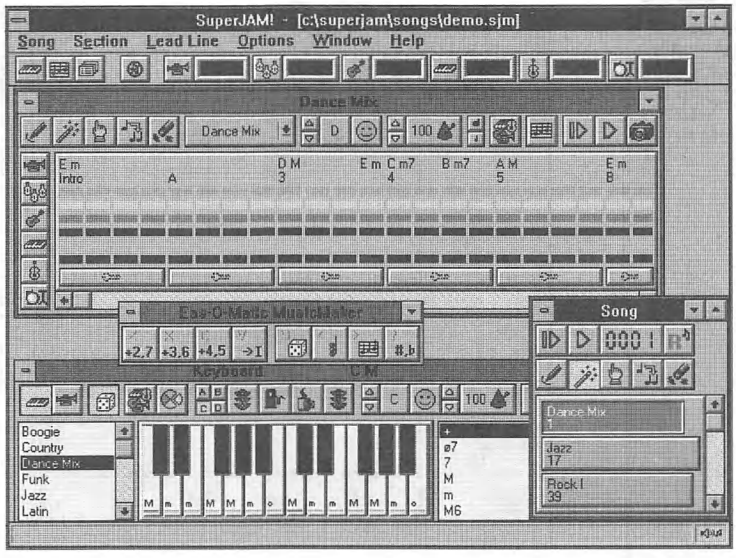
SuperJAM! by Blue Ribbon SoundWorks (Retail: $129)

SuperJAM! (Figure 10-6) is one of the few programs that helps any non-musician create original music. You simply select a style of music from the 30 styles included, then choose a key and tempo, and click on the Play button. You're on your way to creating your own musical masterpiece.

You can purchase additional styles from Blue Ribbon apart from the standard repertoire, which includes rock, pop, jazz, dance, classical, and

FIGURE 10-6

SuperJAM! by Blue Ribbon SoundWorks



samba. You may choose to create your own style as well. These styles include complex musical instructions that help you create dynamic original music. Each one contains special musical embellishments like intros, fills, breaks, and ends, to provide you with different means of expression when composing. To top it off, each style includes four distinctive rythmic grooves that can help you fill your composition with an ever-changing, lifelike sound.

An onscreen keyboard is controlled with a mouse or your computer keyboard, allowing you to make changes to your composition quite easily. Strike up the band with up to six other instruments (which you can select individually) that follow your lead.

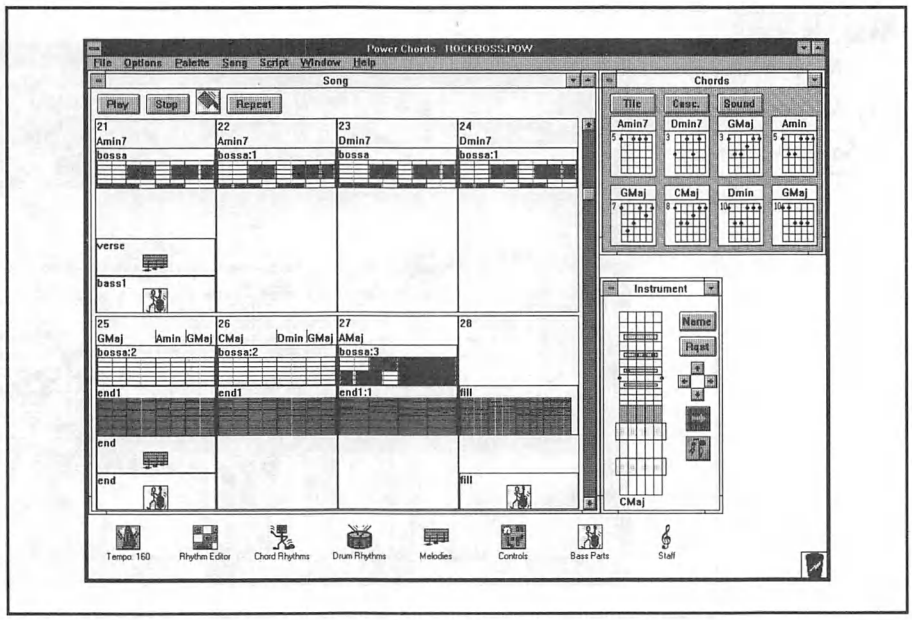
When you feel more ambitious, you can use the editing and recording features of SuperJAM! to change drum mappings, edit notes, control velocity, and perform real-time recordings. Your work can be saved in a standard MIDI file, allowing you to share your compositions with friends and enemies alike.

Power Chords by Howling Dog Systems (Retail: $84.95)

Power Chords (Figure 10-7) is an innovative sequencing program that differentiates itself from other sequencers by using an onscreen guitar (or other stringed instrument) to build chords that are then used to create songs. Other portions of the music, such as the drum and bass parts, can also be created and easily plugged into the song framework.

FIGURE 10-7

Power Chords by Howling Dog Systems



Power Chords actually allows you to use the mouse to "play" the guitar. Guitarists and string players can even draw chords right on the screen. Power Chords also lets you pluck, strum, and do "string bends" and "hammer-ons" too. The onscreen instrument can have up to 12 strings and 24 frets and can be tuned any way you want. You'll find it simple to recreate the sounds of instruments, such as guitars, banjos, and ukuleles, or to create new, fantasy instruments.

Because of its unique interface, you don't have to know how to read score sheets or music notation. There is even a chord request feature: You can request almost any chord, and Power Chords provides a number of different variations on it no matter how many strings the instrument has or how it is tuned.

Writing music with Power Chords is easy. You first create a chord progression and then build a plucking or strumming pattern. This chord progression repeats until another pattern is encountered. Drum and bass parts are created similarly and are also automatically repeating.

Power Chord's comprehensive scripting capability is best demonstrated by the interactive tutorial and demo (which were written entirely using Power Chord). Lesson and presentation scripts can be created with relative ease. If you are a musician, the recording capability allows you to simply play and record your performance with a MIDI instrument. Any mistakes can be corrected using the built-in editor. Power Chords also imports and exports files in standard MIDI format.

Boom Box by Dr. T's Music Software (Retail: $59.95)

Are you ready to jam? Boom Box (Figure 10-8) is an exciting interactive program that allows you to get in the groove by triggering music samples using a keyboard, mouse, or joystick.

Boom Box draws heavily from the metaphor of popular rap and hip-hop styles. Dr. T's Music Software recruited the assistance of musical engineers from New York City's acclaimed Unique Recording Studios to create a number of the featured musical grooves. A lot of the grooves were developed by the same people who create some of the tunes you hear on the Billboard Top 100.

Boom Box's Remix screen allows you to completely rearrange the songs, mix the different instruments and effects, trigger outrageous samples, and even record your virtuoso performances to disk.

This is a party machine. You will love it and your friends won't leave it alone. Your Pro Audio sound card with Boom Box will transform you from a computer nerd to the coolest guy with a computer. Break it down; check it out!

QuickScore Plus by Dr. T's Music Software (Retail: $149)

This DOS-based combination sequencer and notation program allows you to simply "draw in" notes with a mouse or record a MIDI keyboard

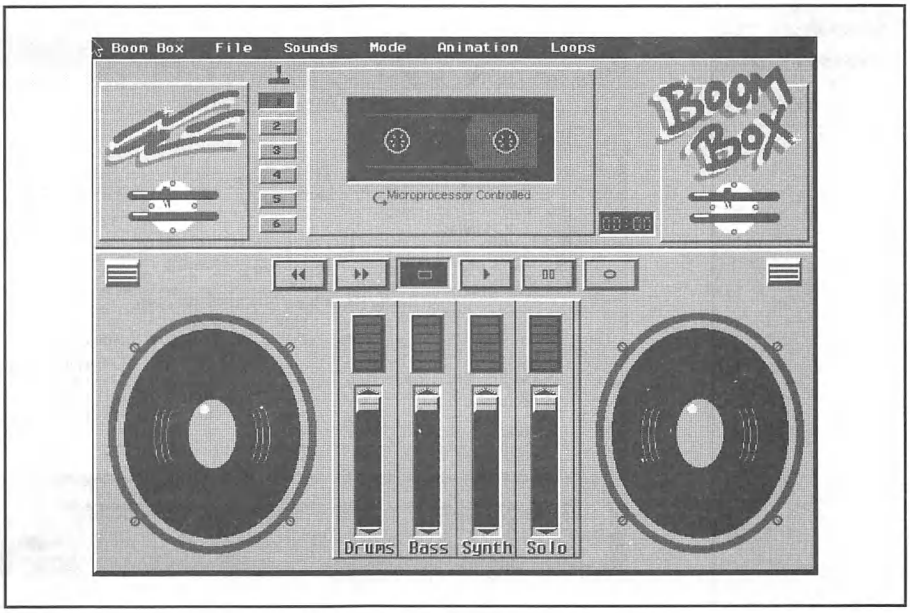


FIGURE 10-8 *Boom Box by Dr. T's Music Software*

performance in real-time using an icon interface. You can immediately see and play back your score, up to 16 tracks simultaneously.

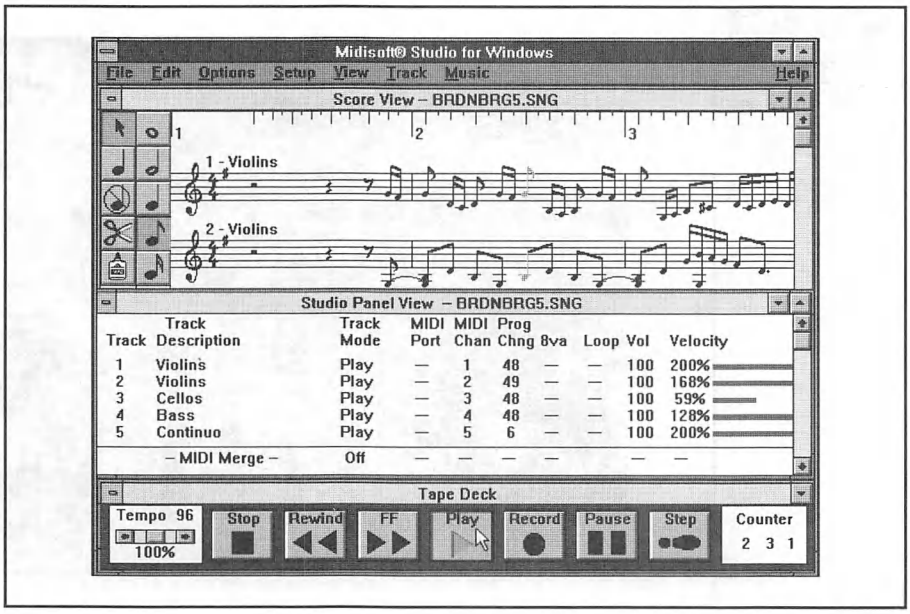
With the Pro Audio sound card, a MIDI keyboard is not required for recording, editing, and/or playback in QuickScore Plus. The program allows you to enter any time or key signature and add any tempo changes at any point in the score. You can also enter lyrics in a composition; but QuickScore Plus, or any other notation program for that matter, has yet to gain the ability to sing the lyrics.

Studio for Windows by Midisoft Corporation (Retail: $249.95)

This Windows-based program is a MIDI music composition and playback control program that allows music and multimedia enthusiasts to compose, record, edit, and print music with their Pro Audio sound card-equipped PC. Studio for Windows (Figure 10-9) displays standard music notation in real time—a capability that, together with its Windows interface, provides an intuitive and spontaneous environment for creating music. Heading the list of powerful editing features that contribute to the program's versatility are Punch, Loop, Splice Cut/Paste, and Step Play.

With Punch, you can record a new part, and Studio automatically inserts it quickly and accurately into a predetermined place within an existing track. This technique is often easier than editing the track manually. Loop is a convenient feature to use when a phrase or section needs to be repeated. For

FIGURE 10-9
Midisoft Studio for Windows



example, it allows you to record one or more measures, select them, and choose the number of repetitions.

Splice Cut removes a selected passage from a track and shifts all subsequent measures earlier in time to fill the empty space. Splice Paste takes a selection from the clipboard and places it into a target area on a track. Subsequent measures are shifted later in time to make room for the pasted music. Step Play is a mode that steps through music one event at a time. This feature is useful for a dense passage of music that you want to isolate and hear each note or phrase.

Studio for Windows is the only notation-based MIDI sequencer that provides a score printing capability. You can select the tracks you wish to print, including text for header and footer information, page numbers, track numbers, and measure numbers.

The program is tightly integrated with Windows 3.1. It supports the MIDI Mapper feature, which lets users conveniently specify different mapping schemes to coordinate their sound devices, using either General MIDI standards or Microsoft's Authoring Guidelines for MIDI files. With the multi-MIDI port feature, you have access to more than 16 MIDI channels and can easily assign different tracks to specific MIDI devices.

MusicTime by Passport Designs (Retail: $249)

Passport Designs has been long established in the Apple Macintosh market as one of the premier providers of MIDI and music software. With the MusicTime Windows software, which echos its Mac siblings in capabilities, Passport offers some of the best MIDI software around for the PC.

Watch your music and songs come to life in standard music notation with MusicTime (Figure 10-10). This program lets you place notes on an electronic staff paper with a mouse. Simply click and drag notes with a mouse from the toolbox onto your musical score. Any musical symbol—notes, sharps, flats, and others—can be used. You can even play each note through the PAS while you're composing. You can notate up to six staff systems with up to four voices.

One of the best features of MusicTime is its ability to record a live performance onto a score (if you have a MIDI keyboard hooked up to your Pro Audio sound card). MusicTime transcribes what you play into standard music notation. Score sheets can also be automatically produced from a standard MIDI file.

With MusicTime, note-aligned lyrics and text can be added to your composition. Add guitar chord notation to the score and justify the music as well. Of course, you can transpose notes and change the key of your music

FIGURE 10-10
MusicTime by Passport Designs



too. When your masterpiece is printed on a laser printer, you have professionally published-quality sheet music.

The program is very useful for music teachers, band directors, and choir directors. You can easily enter a score by recording a performance, then, using MusicTime's transpose function, switch it to another key or transpose the score for another instrument. Finally, you can reprint the edited score for other performers or members of the group.

If you're a professional composer, the additional capabilities of Encore, MusicTime's paradigm and elder brother, may prove to be more suitable.

Encore by Passport Designs (Retail: $595)

Encore is a full-featured music notation software. Priced for the professional musician, it has all the features of MusicTime, plus a few other advanced features.

While MusicTime only allows six staffs, Encore allows up to 64. This comes in handy if you're composing for an orchestra (those of you who aspire to be like John Williams, please take note). Encore also performs multiple part extraction for those complicated scores.

A header and footer capability helps you keep your pages organized. You can have more than one score open at any time. Using cut and paste, you can easily transfer, or duplicate, sections of one score to another.

Master Tracks Pro by Passport Designs (Retail: $395)

Master Tracks Pro (Figure 10-11) is a professional MIDI sequencing software. It features the capability to record up to 64 tracks, step-time input, and graphic and event list editing. The dizzying array of buttons and menu options on the screen may confuse the uninitiated, but Master Tracks Pro promises to deliver its powerful features with fast and intuitive operation for those so inclined.

Clearly aimed at the high end, Master Tracks Pro provides esoteric features, such as the ability to "sync-lock" your music to SMPTE (Society of Motion Picture and Television Engineers) time standards via MIDI Time Code with MIDI/SMPTE interface (which allows you to synchronize your music to film, video, or tape), automatically chase MIDI controllers and program changes for automation control, fit time to SMPTE values, and control the music's feel by sliding regions forward or backward in time.

The track sheet in Master Tracks combines song and track information into one area. Adjustments to the volume fader can be recorded, which allows you to perform live mixing with immediate graphic feedback.

If you're a performing musician, you'll like the Song Play List feature. It allows you to cue up several files for automatic playback in any order. You can use a variety of ways to stop and start playback, including using a pedal hooked up to your MIDI keyboard.

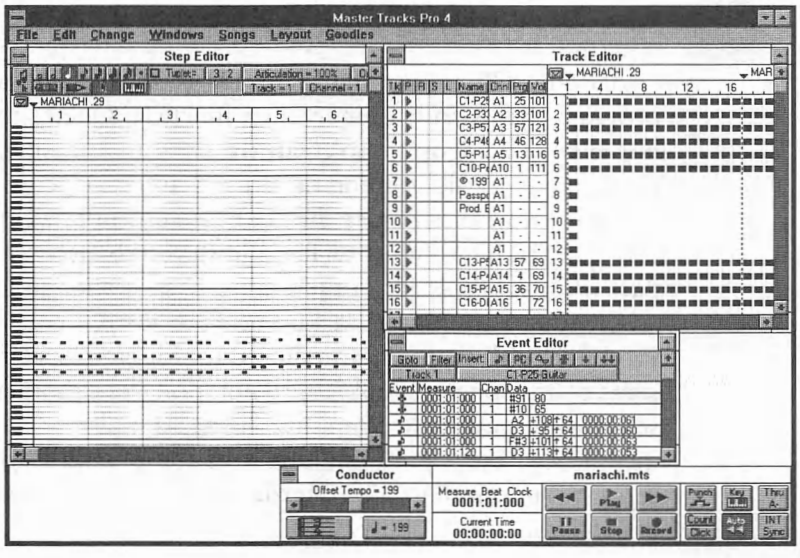


FIGURE 10-11 Master Tracks Pro by Passport Designs

Also of interest to those of you who perform live, Master Tracks Pro has a Preset Palette feature, which allows you to automatically select different sets of sounds for different keyboards. You can also edit this list and add banks of presets (groups of pre-programmed instrument sounds) from synthesizers that are not included with factory-supplied sounds.

Other Master Tracks Pro highlights include editing and recording features too numerous to list that should prove to be more than adequate even for the most demanding professional musicians. The program has a consistent interface and is easy to learn. Like other sequencer software, Master Tracks Pro really shines when you hook up a professional MIDI keyboard to the Pro Audio sound card.

Trax by Passport Designs (Retail: $99)

Trax is a MIDI sequencer based on Master Tracks Pro. Both siblings share a similar interface. This scaled-down version omits some of the esoteric functions and features (which may be a requirement for professional applications) found in Master Tracks Pro.

At a bargain basement price of $99 for sequencing software, Trax is a steal. Moreover, you can progress to Master Tracks Pro very easily when your requirements outgrow Trax.



NOTE: *Media Vision includes a special version of Trax and MusicTime, called Trax with Notation, with the Pro AudioStudio 16XL.*

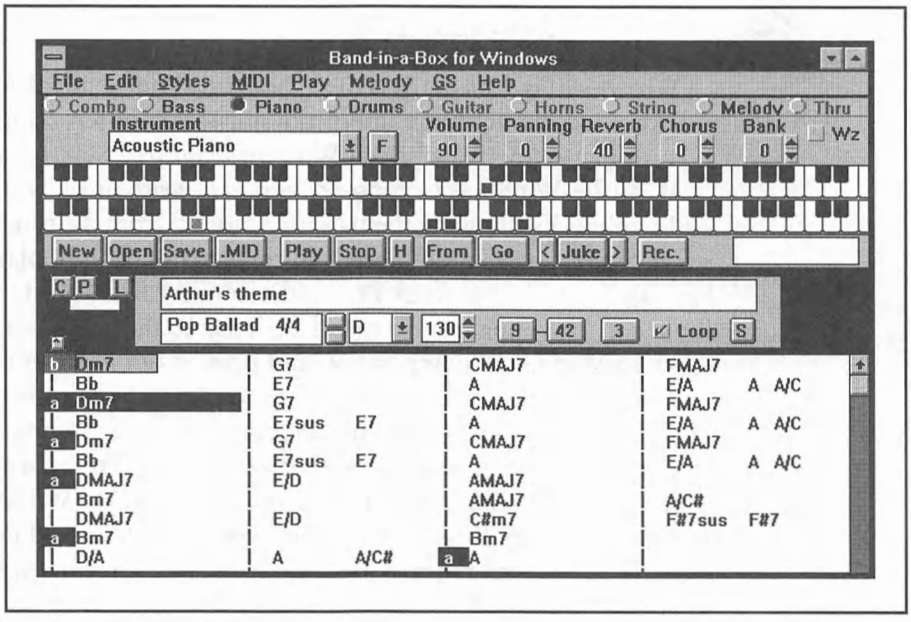
Band-in-a-Box Pro by PG Music (Retail: $88)

Band-in-a-Box Pro (Figure 10-12) is an amazing auto-accompaniment program that is truly unique in its function. One of the challenges for any musician or composer is to create the various accompaniments, or interment parts to any music. Adding these parts and producing good music requires that you know how to play the main instrument as well as the accompanying instruments. Band-in-a-Box Pro allows you to just concentrate on your lead part while it takes care of the drums, bass, piano, guitar, and string parts.

Creating a song with backup instruments is a cinch with Band-in-a-Box Pro. Here's all that you're required to do: First, specify the chord progressions of any song in simple chord notation (for example, C or Fm7). Second, select a musical style from jazz swing to waltz to new age; 75 styles are included with the program, and an additional 25 styles are available in a separate set priced at $29. Third, select a tempo, start the metronome, and off you go.

FIGURE 10-12

Band-in-a-Box by PG Music



The results can be very satisfying, and often you can hear interesting, professional-sounding material emanating from your Pro Audio sound card or MIDI instruments. Don't worry if you have no idea where to start composing; Band-in-a-Box Pro includes some tunes in the package to get you started. Another 100 pre-built songs can be purchased for $29.

Elementary sequencer capabilities, such as editing and saving to MIDI format files, are built into Band-in-a-Box Pro. You can save a file with or without the melody (which can be a recording of your performance). These files can then be edited in other more capable sequencers.

You owe it to yourself to listen to some of what Band-in-a-Box Pro comes up with, given a certain song and style. It is both educational and fun to just vary the style and listen to the different musical results from the program. Selecting different instruments (Fender Bass versus Upright Bass, for example) can also dramatically alter a song.

The Band-in-a-Box Pro package includes both DOS and Windows versions and works with the Pro Audio sound card FM synthesizer or MIDI port. Files created with either version are completely compatible and interchangeable with each other. A Band-in-a-Box Pro Standard Edition with 24 styles is available at a reduced cost of $59.

If you're like us and you lack one or more of the instrument skills necessary for becoming a one-person showcase, Band-in-a-Box Pro is the perfect solution and is certainly a most capable addition to your repertoire. It is the next best thing to having a live band at your disposal.

WinSong by Softronics (Retail: $79.95)

WinSong (Figure 10-13) is the Swiss army knife equivalent of MIDI music software. Softronics has combined a music composer, sequencer, and jukebox into an attractively priced Windows-compatible product.

With the WinSong Composer, you can write music with musical notes and symbols by dragging them (with a mouse) from the toolbar onto a music staff. Notes can also be placed on the staff by simply playing on a MIDI keyboard attached to your Pro Audio sound card. The staff scrolls by as it is played, providing instant visual feedback to the notes being played. Lyrics can be added to the composition and printed out as sheet music.

The WinSong Sequencer allows up to 64 tracks to record separately and mix together for a full performance. It converts any standard MIDI file into standard notation for editing with the Composer. You can also loop, move, transpose, and adjust the volume of entire tracks. WinSong's Sequencer supports complex time signatures as well as user-defined non-standard key signatures. As with most sequencing software, you can quantize, cut, copy, paste, transpose, and change volume, length, and pitch for each MIDI channel.

To listen to your compositions, use WinSong's Jukebox to queue up any number of MIDI files. You can create sets of music to suit your changing moods. Use it to play background music as you work.

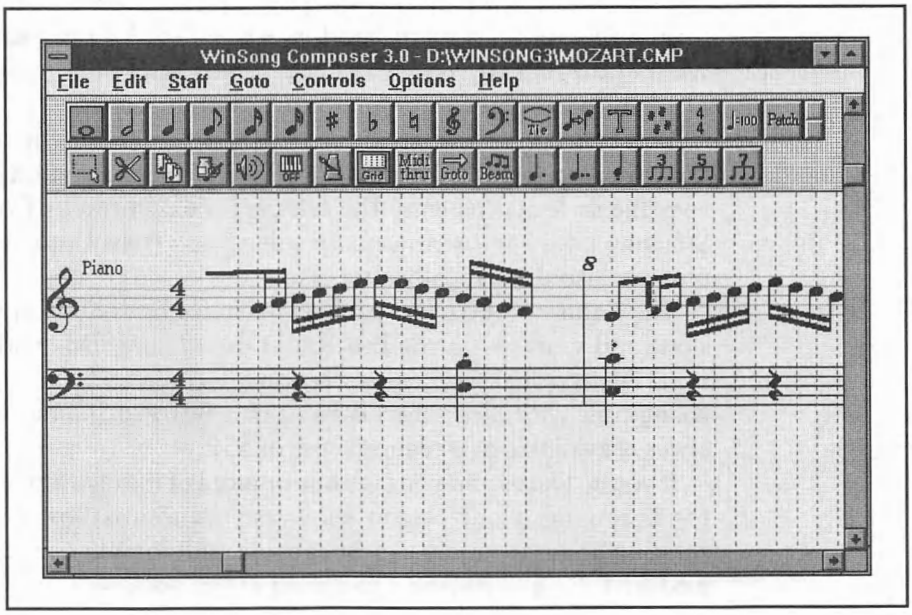


FIGURE 10-13 *WinSong by Softronics*

Cakewalk Professional by Twelve Tone Systems (Retail: $349)

Cakewalk Pro (Figure 10-14) is a MIDI sequencer with an easy interface and a potent set of features. Having already taken a commanding share of the DOS sequencer market, Cakewalk's Windows version should set a few standards for other software publishers to match.

Cakewalk Pro's greatest asset is that it can have multiple views and editing windows on the screen at once. Changes made in one window are instantly reflected in all other windows, and they all update during playback. These windows include a track/measure view, a piano-roll grid, and a staff view that can display up to ten staves at once. An event list can also be displayed along the separate graphical controller and fader windows.

Other professional-level features found in Cakewalk Pro include fractional tempos (for example, 120.34 betas per minute); pitch and velocity transpositions; a built-in application language for creating, among other things, your very own chord generators and drum maps; and support for all four SMPTE and MTC (MIDI Time Code) synchronization formats. And though most sequencers record only up to 64 tracks, Cakewalk Pro allows you to record and edit up to 256 tracks. A SysEx (System Exclusive) Librarian has 256 banks to store SysEx information from most keyboard synthesizers.

Cakewalk Pro supports MCI (Media Control Interface) commands in tracks. This allows you to control and synchronize equipment such as CD

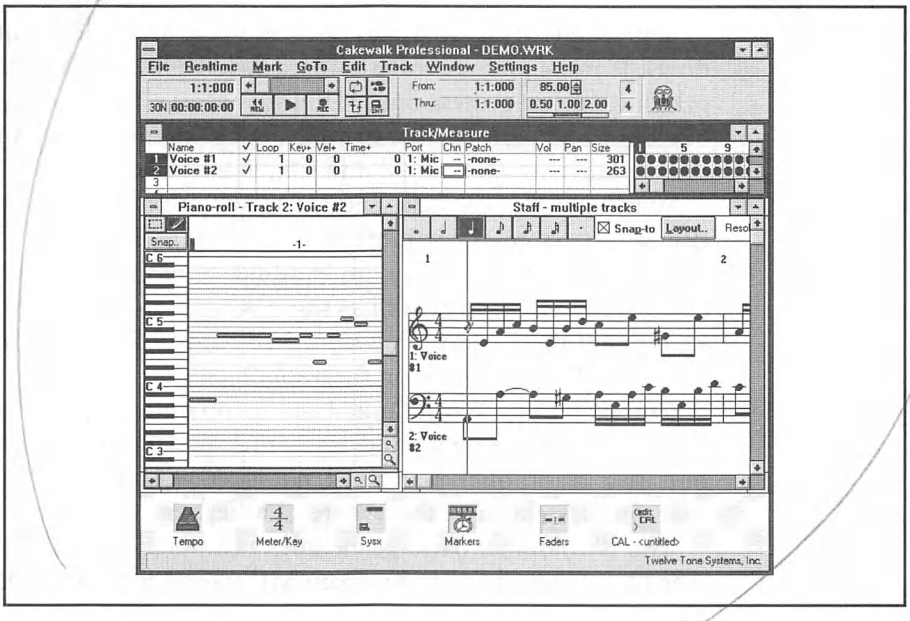


FIGURE 10-14 *Cakewalk Pro for Windows by Twelve Tone Systems*

players and VCRs to MIDI sequencers. Digital audio data in a Wave (.WAV) file can be embedded into a sequence as well.

Cakewalk Pro has about every feature a professional could ask for. The program lacks a score sheet printing capability, but it lets you store your sequence in standard MIDI format so that you can use a notation program such as Passport's MusicTime to print the score. Cakewalk Pro is arguably the best-executed MIDI sequencer on the market.

Sequencer Plus series by Voyetra Technologies (Retail: $69.95-$299.95)

The Sequencer Plus series is made up of the big brothers to Sp Pro, Voyetra's line of DOS-based MIDI sequencers/editors. The series includes Sp Jr, Sp Classic, and Sp Gold. These sequencers are capable of addressing the Pro Audio sound card's internal FM sounds while simultaneously triggering external MIDI instruments.

The Voyetra DOS sequencers are more difficult and confusing than Windows-based products. This is an inherent problem with most DOS text-based software when compared with their Windows counterparts. However, the Sequencer Plus series of products do work as advertised, and should be seriously considered if you're looking for a sophisticated DOS-based MIDI sequencer.

WinJammer by WinJammer Software Limited (Shareware: $50)

WinJammer (Figure 10-15) is a full-featured MIDI sequencer for Windows. It plays and records standard MIDI files. WinJammer may not be a match for other professional MIDI sequencers in terms of the sheer number of editing and performance features, but sometimes less is more. In this case, the payoff is an uncluttered and simple interface.

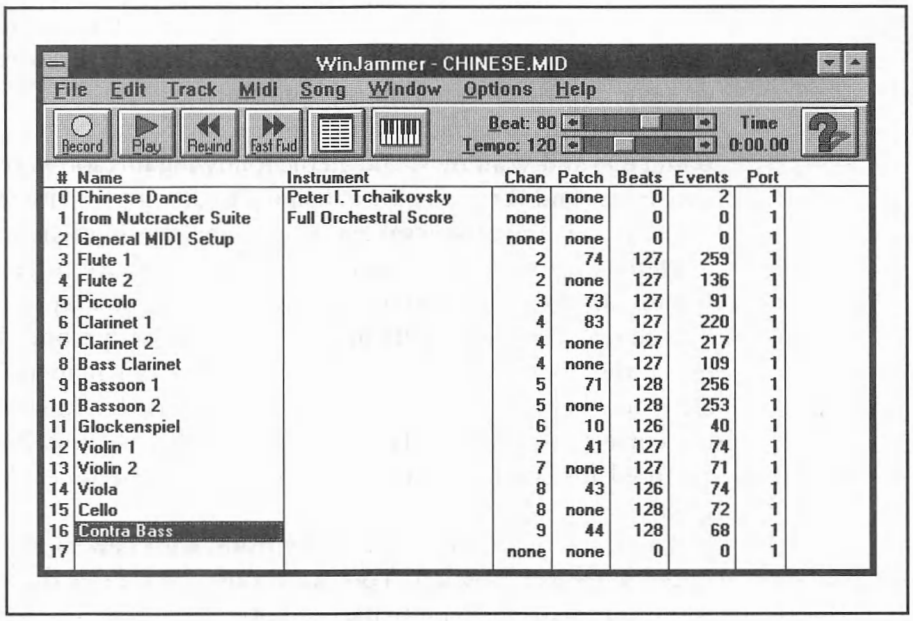
WinJammer is the only sequencer we ran across that reads ROL files. (Refer to Chapter 4 for more information on ROL files.) This one feature clearly reveals the primary target audience for WinJammer—the beginning or amateur MIDI-ite as well as those who do not have a MIDI keyboard to accompany their Pro Audio sound card but would like to start creating music with the FM synthesizer on their sound card.

You won't find WinJammer lacking too much in important features. You can create up to 64 tracks and use up to 256 MIDI channels. Editing is carried out in a traditional piano-roll notation window. WinJammer can send real-time system-exclusive events (synthesizer-specific data) as well.

The WinJammer package includes a companion program called WinJammer Player, which is used to play MIDI song files in the background while

FIGURE 10-15

WinJammer



#	Name	Instrument	Chan	Patch	Beats	Events	Port
0	Chinese Dance	Peter I. Tchaikovsky	none	none	0	2	1
1	from Nutcracker Suite	Full Orchestral Score	none	none	0	0	1
2	General MIDI Setup		none	none	0	0	1
3	Flute 1		2	74	127	259	1
4	Flute 2		2	none	127	136	1
5	Piccolo		3	73	127	91	1
6	Clarinet 1		4	83	127	220	1
7	Clarinet 2		4	none	127	217	1
8	Bass Clarinet		4	none	127	109	1
9	Bassoon 1		5	71	128	256	1
10	Bassoon 2		5	none	128	253	1
11	Glockenspiel		6	10	126	40	1
12	Violin 1		7	41	127	74	1
13	Violin 2		7	none	127	71	1
14	Viola		8	43	126	74	1
15	Cello		8	none	128	72	1
16	Contra Bass		9	44	128	68	1
17			none	none	0	0	1

you're working in Windows. The repeat mode and shuffle play options are two unique features of this program.

For those who want a taste of MIDI without spending money up front, this shareware program might just be the ticket. It should be available on many bulletin boards and can be found on CompuServe.

EDUCATIONAL EXCELLENCE

Computers are excellent tools for the school classroom or the home. With the addition of sound and speech capability of the Pro Audio sound card, educational software takes on a whole new dimension. Software can literally direct or talk to the user verbally, which makes the computer easier to use. Many educational software programs are disguised as games to make learning more fun and attractive for both children and adults alike. We'll look at some notable educational titles in this section.

NotePlay by Ibis Software (Retail: $49.95)

Ibis Software has created a series of educational music titles that has been adopted by various school districts, grade schools, high schools, and colleges

around the country. The wide acceptance of its software as an appropriate teaching and learning tool at these varied levels is a testimony to the well thought out, flexible, and mostly fun software.

As amateur guitarists and drummers, we found Noteplay (available for both DOS and Windows) and all the following Ibis software to be extremely easy to use and very valuable in helping to develop and improve our musical skills. These are indispensable tools for any music teacher or student.

Designed primarily for people who want to learn to play music or who want to improve their current playing abilities, NotePlay can be used to teach how to read notes on a staff and play them correctly from a keyboard. Using either the computer keyboard (which has been mapped to replicate an electronic keyboard) or an actual MIDI keyboard, you select and play back the correct notes as displayed on a staff. In this game format, points are awarded for speed and accuracy. If you beat the timer, bonus points are given.

There are 36 drill levels to select from, with new musical phrases introduced with every session. You can choose from three different play modes (slow, normal, and automatic), tailoring the program to your level. Advanced-level drills include two-handed exercises dealing with counterpoint, intervals, and chords. You can choose to practice a certain level as often as you like.

NotePlay for Windows (Figure 10-16) has been designed to be easy enough for beginners, yet powerful enough to satisfy advanced musicians. NotePlay's multileveled approach and different play modes make the program appropriate for users at all levels—beginner, hobbyist, student, or serious musician.

The program can also be used in an exploratory mode by disabling the game. Here you can randomly play notes and see them appear on the Grand Staff in their correct locations and with their correct names. The attractive graphical interface and ease of use make the program as fun as it is instructional.

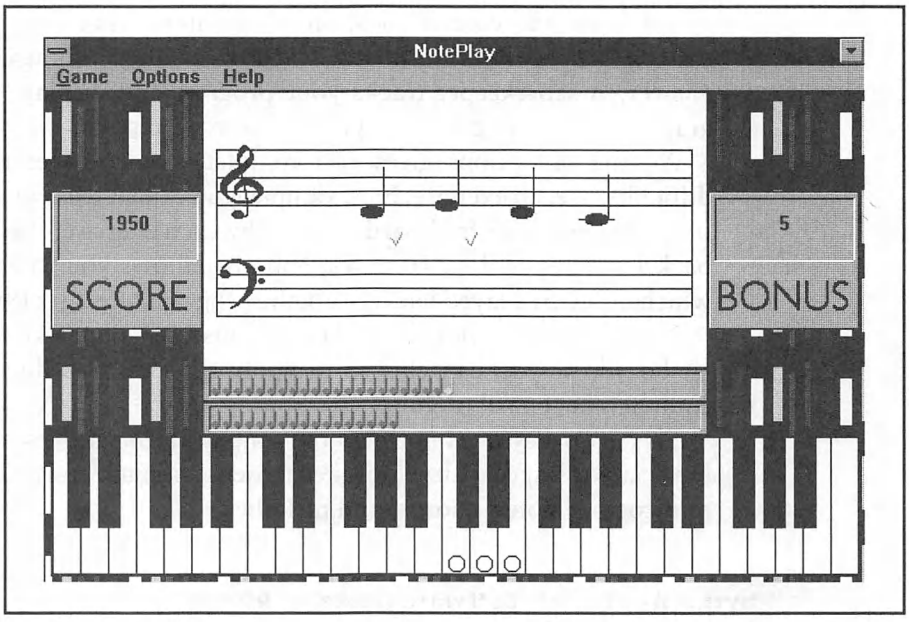
Play It By Ear by Ibis Software (Retail: $99.95)

Play It By Ear (Figure 10-17) provides a variety of self-paced ear training exercises, featuring an onscreen piano keyboard and guitar fretboard. The program's strength lies in its instant response to your actions, helping you to quickly identify and improve upon your weaknesses.

Play It By Ear offers a variety of interactive melodic and harmonic exercises. Topics include note, chord, and interval recognition; chord and interval naming; pitches; scales; modes, and much more.

FIGURE 10-16

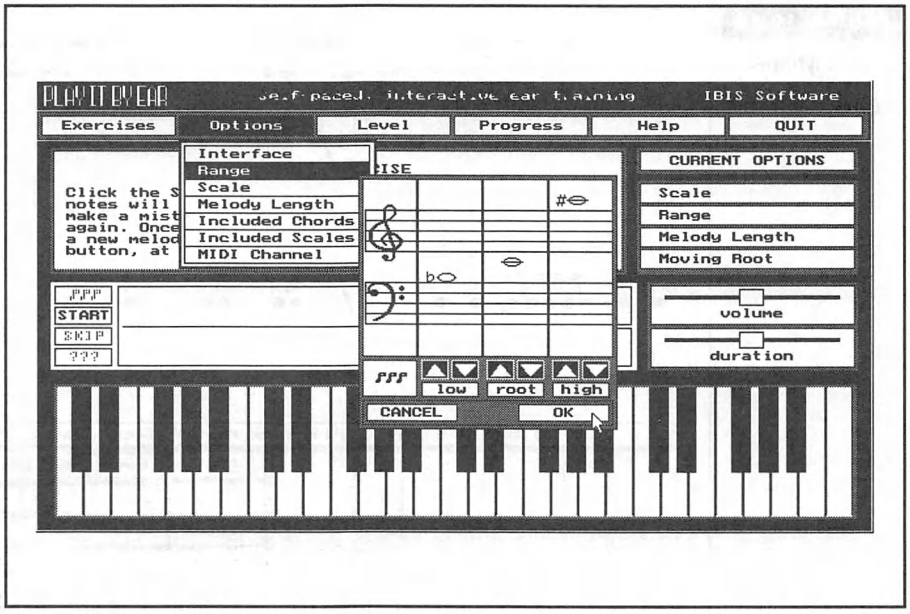
NotePlay for Windows by Ibis Software



In each exercise, you are asked to play back or identify specific notes, melodies, intervals, or chords. The program immediately indicates whether each answer is correct or incorrect. If you are stumped, ask Play It By Ear

FIGURE 10-17

Play It By Ear by Ibis Software



to highlight the correct location of the note, chord, or interval on the onscreen keyboard or fretboard. The program then asks again for the correct answer. A scorekeeper tracks your progress and displays it in a progress graph, post-exercise summary, or an exercise report.

A suite of options gives you complete control over the content and difficulty of each exercise. For example, you can increase or reduce the range of the keyboard or fretboard covered by each exercise. Play It By Ear plays back melodies of 2 to 16 notes, and also allows you to vary the speed at which notes are played back. In all, the program offers six levels of challenge.

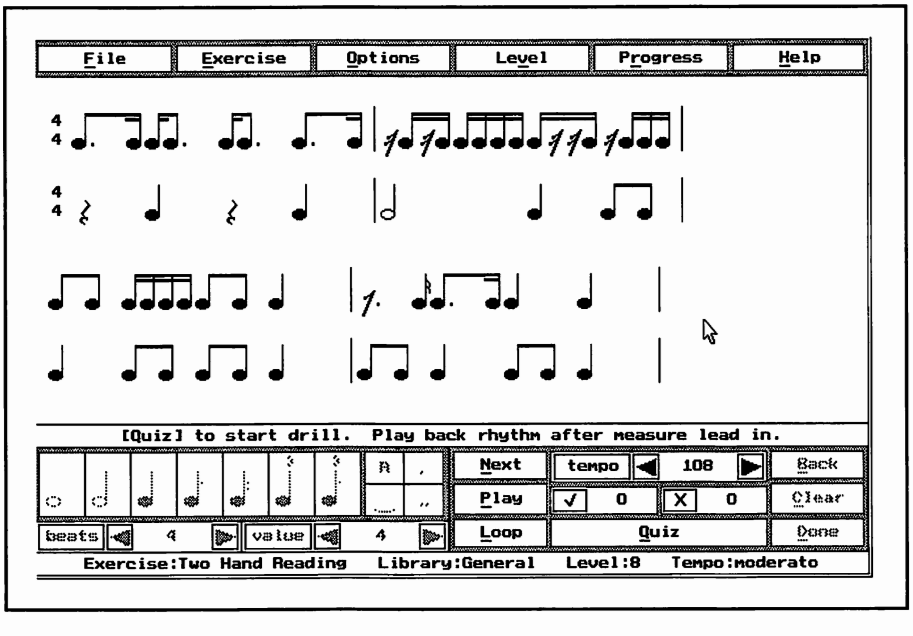
You can use a mouse to play the onscreen piano keyboard or guitar fretboard, or you can choose to apply the exercises directly to a MIDI-equipped keyboard or guitar.

Play It By Ear does not help the tone deaf, but it does help the budding musician or singer to develop a keener sense of pitch and an improved ability to recognize notes, chords, and melodies.

RhythmAce by Ibis Software (Retail: $99.95)

RhythmAce (Figure 10-18) is an interactive music education program featuring onscreen rhythmic notation. Offering a variety of different exercise modes, RhythmAce provides enough flexibility to tailor the presentation of drills to suit individual needs. Topics such as tempo, measures per drill, time

FIGURE 10-18
RhythmAce by Ibis Software



signatures, notation values, and mixed meters provide for a complete rhythm training regimen.

In a typical exercise, you hear a metronome ticking and are required to play back the rhythmic notation shown on the screen using either a mouse, the PC keyboard, or a MIDI keyboard. In another exercise, the program plays a rhythmic phrase and you are asked to reproduce the notation utilizing onscreen notation buttons. Drills are selected from a single user library, including a classical style, which follows traditional notation rules closely, and a jazz style, which reflects a more relaxed notation. The program even includes the option of single- or two-handed rhythms.

RhythmAce provides comprehensive feedback concerning correctness, accuracy, and improvement over time. In the notation area, a red "X" indicates a note or rest played incorrectly. Under this area, two timing diagrams display the expected response and the actual response, letting you know if notes and rests were held the correct length of time. Once the rhythm has been played correctly, the program calculates an accuracy figure based on what it expected and what was actually played. At the end of a block of exercises, you can print a summary of the exercise just performed.

RhythmPlay by Ibis Software (Retail: $49.95)

RhythmPlay (Figure 10-19) is a simpler version, or subset, of RhythmAce, presented in a game format. Special features include an audio and visual metronome, 24 types of drills, sustain and timing accuracy, timing diagram, high score table, slow, normal, and automatic modes, and one- and two-handed exercises. This is an excellent program for beginners to get a feel for rhythm. Experienced musicians can use RhythmPlay to hone their sense of timing. RhythmPlay isolates one of the skills of successful sight-reading, rhythm reading, to help the user concentrate on just this skill.

The 24 types of drills are grouped into six skill levels to provide a progressive introduction to reading and playing rhythms. You begin with simple rhythmic phrases using quarter and half notes in 4/4 time. As you progress, rests, eighth and sixteenth notes, dots and ties, changing meters, and two-handed phrases are introduced into the drills.

Typical applications for RhythmPlay may include rhythm training for church choir members or training drummers to read rhythms off a score.

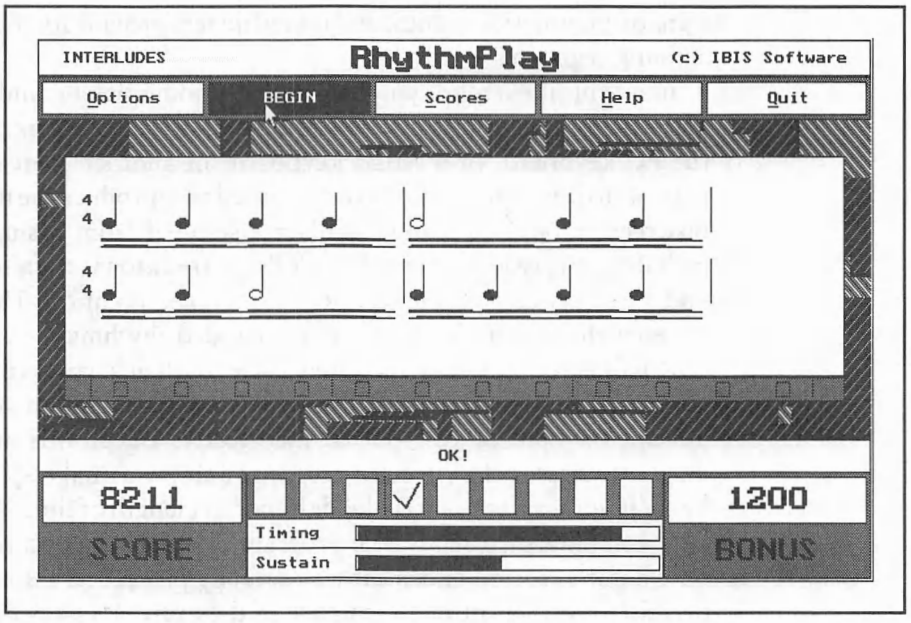
Soloist by Ibis Software (Retail: $59.95)

Soloist (Figure 10-20) is another innovative program from Ibis Software. Basically, this program allows you to hone your skills as a musician or singer by measuring your accuracy. This is done by attaching a microphone to your

FIGURE 10-19

RhythmPlay

by Ibis Software



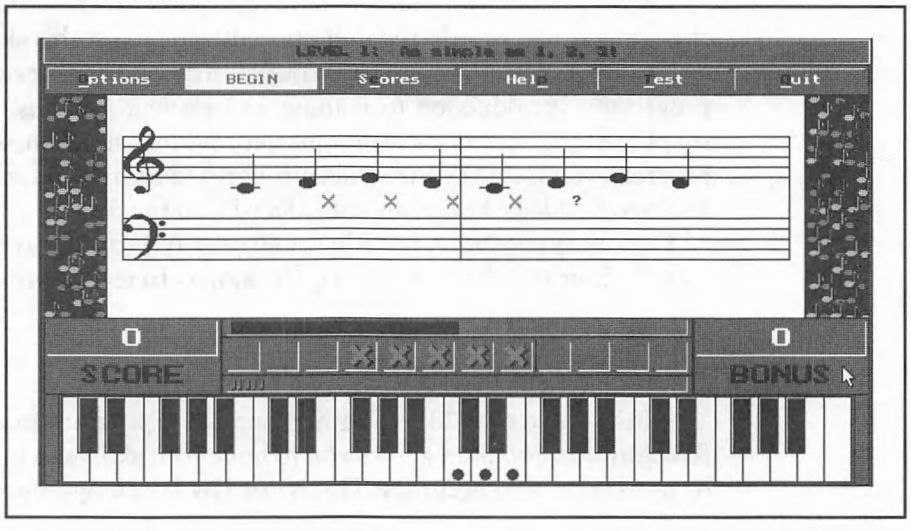
Pro Audio sound card and playing the instruments while following the notes that are displayed on the screen. Soloist provides several measures of music for you to follow with any instrument that you care to use: piano, guitar, violin, trumpet, saxophone, or even your voice.

Soloist presents these practice sessions in levels. Once you've successfully played a given number of notes, you advance to a higher level where the

FIGURE 10-20

Soloist

by Ibis Software



sequence of notes becomes harder and you have to deal with tempo changes as well. The program is designed to provide the budding musician with practice in sight-reading and playing. Using Soloist to check the accuracy of your singing voice is especially fun.

The only drawback to soloist is that it does not recognize chords. Since it's targeted at solo instruments and beginning musicians, this is not a big loss. As a bonus, the program can be used to tune your instrument. The manual also contains a succinct section on music theory. Soloist is an excellent program for beginning and improving musicians.

Music Mentor for Windows by Midisoft Corporation (Retail: $149.95)

Music Mentor offers an entertaining music tutorial and utilizes a notation-based MIDI sequencer that makes music concepts spring to life, even for beginners. The product features lively text, graphics, animation, and MIDI-generated sounds.

For those just getting started in music, Music Mentor offers an introduction to basic music reading skills and explains the essential elements of all musical composition—rhythm, melody, harmony, timbre, texture, and form. The tutorial includes demonstrations of the ways in which famous composers have used musical elements in the different musical periods.

Because Music Mentor stores information in standard MIDI file format, you can access and manipulate all musical examples in the program. After listening to various pieces and learning about their components, you can then alter sounds, tempos, and other aspects of the music however you please. Even newcomers to music will find concepts like pitch reading and rhythm notation easier to grasp with Music Mentor's multimedia approach.

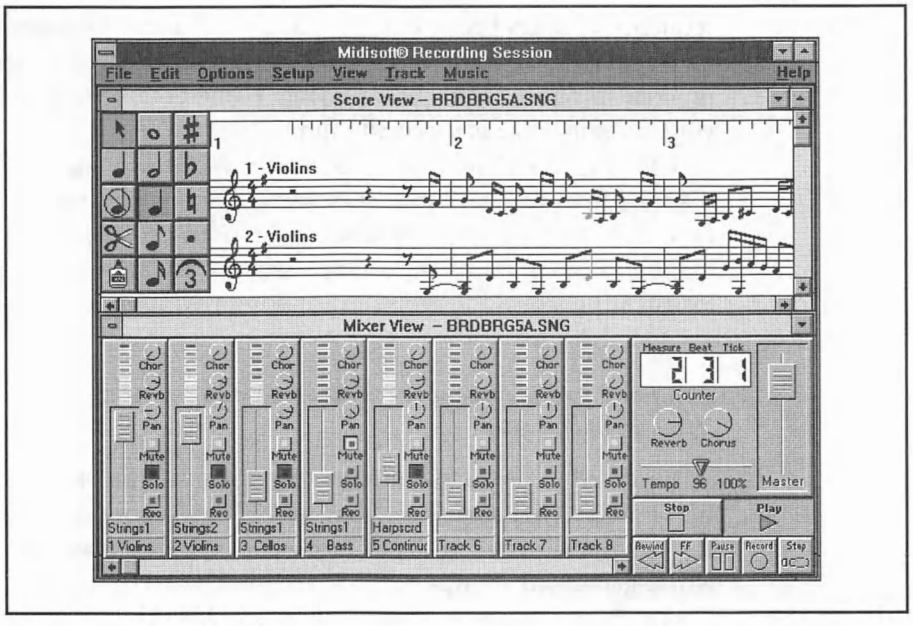
Music Mentor includes a notation-based MIDI recording and editing utility called Midisoft Recording Session for Windows (Figure 10-21). Music Mentor and Recording Session interface in such a way that you can listen to an example in the tutorial session, and with a single command open Recording Session to edit or play along with the piece. You can also create original music in Recording Session, or import MIDI files from other sources.

An important benefit of Recording Session is that it displays music in standard notation during both recording and playback like its upscale counterpart, Midisoft Studio for Windows. This capability sets it apart from common sequencer-style MIDI event lists and graphic editors, which tend to be less intuitive for users.



NOTE: *Recording Session is included with both the Pro AudioStudio 16 and the newer Pro AudioSpectrum 16.*

FIGURE 10-21
Midisoft Recording Session



USEFUL UTILITIES

This section describes various utilities to help you use your Pro Audio sound card to the best of its abilities. You'll find utilities that are simply fun additions to your computer, some software that allows you to experiment with generating sounds, as well as sophisticated sound editing tools. Most of these software programs are Windows applications, while a few are geared for those of you who still work in DOS.

Whoop It Up! by Advanced Support Group (Retail: $79.95)

Whoop It Up! attaches sound, both Wave and MIDI files, to Windows events, such as Application Stat and Shutdown, Move, Minimize, Maximize, and many others. It can also attach sounds to message boxes such as the Exclamation box and Question box icons. Each application can have its own custom set of sounds assigned to it. There is even a random feature that selects a random sound everytime you use the program.

Whoop It Up! includes over 2.5 megabytes of Wave and MIDI files. Additionally, the four following utilities are all part of this collection:

- Yakkity Clock is a talking clock that features both preset and custom alarms, voice announcement of the time at various intervals, and both a male and female voice. It can be configured to display time maximized or as icon text when minimized.
- Yakkity Monitor is a talking system monitor. It continuosly monitors system resources and disk space and literally tells you when they fall below the preset levels. The program can be set to "stay on top" so that you can visually monitor Windows's current use of resources.
- Wave Editor is a 16-bit stereo Wave file editor that boasts as wide a range of features as any professional sound editor. Besides basic functions such as recording and cut and paste, Wave Editor provides routines for fades, transforms, filters, and echoes.
- Yakkity Savers is a collection of fourteen screen savers that include sound and animation sequences. With Yakkity Savers loaded, you can have fun with animated mice on pogo sticks and rollerblades, skiing fruit, and various kaleidoscope-like savers that you see on your screen. These savers work with the standard Windows 3.1 screen saver program.

Wired for Sound Pro by Aristosoft (Retail $79.95)

The granddaddy of this type of utility, Wired for Sound Pro enhances Windows by allowing you to attach sounds to Windows events. Over 100 sound effects in Wired for Sound Pro provide ear candy for most mundane Windows events such as moving or resizing windows. A talking system monitor, a talking clock, and a Wave sound editor round out this collection.

After Dark by Berkeley Systems (Retail $49.95)

After Dark is one of the largest selling Windows utility software programs. It was first made available on the Apple Macintosh but has gathered quite a following in the Windows arena. This is the program that started the screen saver craze. Most modern VGA color monitors actually do not have problems of the older CGA and monochrome monitors with phosphor burn-in. Software programs like these are more fun than functional and are great entertainment.

After Dark is a screen saver for Windows that includes the famous flying toasters and the ever popular fish aquarium. The different modules sport different sounds including "blub-blub" sounds to accompany the air bubbles

from the aquarium module. There are howling coyotes and screen-munching worms among the 40 or so modules. Our favorite is the Swan Lake module, in which beautifully rendered swans and their cygnets float and swim gracefully across the screen. More After Dark is an add-on module that adds over 20 fun modules to After Dark.

Another version of After Dark is tailored for Star Trek aficionados, aptly called Star Trek: The Screen Saver. This version contains digitized pictures of the actual crew from the TV series. It also features actual sound effects, music, and dialogue from the original series. Go ahead, reminisce, as Captain Kirk says, "Scotty, get us out of here!" Star Trek: The Screen Saver is, as Mr. Spock would say, "fascinating."

Blaster Master by Gary Maddox (Shareware: $29.95)

Blaster Master is a DOS-based program for working with Pro Audio VOC, WAV, and SND format files. It requires EGA/VGA graphics, a mouse, a hard disk, and preferably a fast PC such as a 386 or 486. Blaster Master is available as shareware. The unregistered version only processes a sound file of up to 25 seconds, while there is no limit on the registered version.

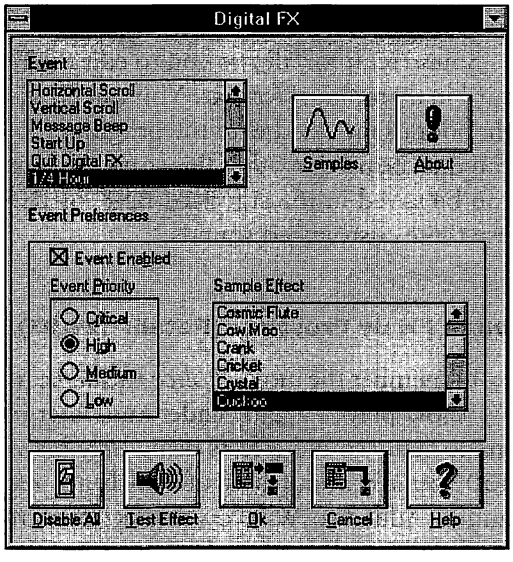
The program is completely mouse-driven. Features include conversion among the different supported formats and sampling rates. You can add effects such as echoes and fades. The mouse-driven interface is easy to learn and use.

EZSound FX by Future Trends Software (Retail: $69.95)

EZSound FX is a multipurpose sound utility for Windows. Six different programs are included with EZSound FX, each one with specific capabilities.

- Digital FX (Figure 10-22) and Synth FX allow you to attach any sound or music to such mundane events as resizing a window or deleting a file. These are separate software that can be run simultaneously; for instance, you can have Digital FX play a digitized gunshot when you close a window, while Synth FX plays the beginning of Beethoven's 5th whenever you resize a window.
- Music FX plays music files (CMF and ROL formats) in the background while you're working on other more important matters. Over 100 such files, from classical to new age, are included.
- CD FX is a CD player program included for those who also have a CD drive connected to their Pro Audio sound card. While it is a very basic program without any fancy displays or database features, CD

FIGURE 10-22
EZSound FX's Digital FX by Future Trends Software



FX works well and is an adequate enhancement to the Windows Media Player when you want to listen to a CD.

- Master FX is a versatile sound editor that fully supports stereo recording, editing, and playback on the Pro Audio sound card. It imports and converts sound files from various formats, even those from Macintosh, Amiga, NeXT, and Sun. You can start experimenting with the over 100 included digital sound effects. Master FX supports sampling rates from 5,000Hz to 44,100Hz, but lacks the ability to support 16-bit recording. That aside, it is very easy to use and the variable view magnification and resizable window are a big improvement over the standard Windows Recorder.
- Panel FX is a custom control panel for controlling the volume level of the Pro Audio sound card. Additionally, you can use it to adjust and assign the Windows system error sound.

EZSound FX easily qualifies as the bargain of the bunch of Windows sound utilities for your Pro Audio sound card. The program interface is simple and intuitive. If your budget is tight (whose isn't nowadays?), this is the one to get.

SoundSculptor by Ibis Software (Retail: $39.95)

SoundSculptor allows you to edit the FM sounds of the Pro Audio sound card in a graphical format. You can create your own sounds or edit some of the sounds included with the program. Sounds created using SoundSculptor can then be used in other Ibis software such as RhythmPlay. Since the sounds can be saved in the standard BNK or INS format, other software can also use these customized sounds.

Mr. Sound FX by Prosonus (Retail: $24.95)

Remember the movie *Police Academy* and its long line of sequels? Michael Winslow played a zany cadet and, later in the sequels, a police officer who made many sound effects using only his voice. Mr. Sound FX includes over 150 sounds, about half of which are recordings of Mr. Winslow's vocal antics. Added to Winslow's selections are short music cuts including riffs, fanfares, and "blats" and other assorted sound effects.

With an incredible display of vocal gymnastics, Mr. Winslow's repertoire in this package includes such notable feats as car crashes and brakes squealing, jet flybys, bird tweets, a UFO flyby, a tennis ball, and the sound of breaking glass. You can integrate them into your own multimedia presentations.

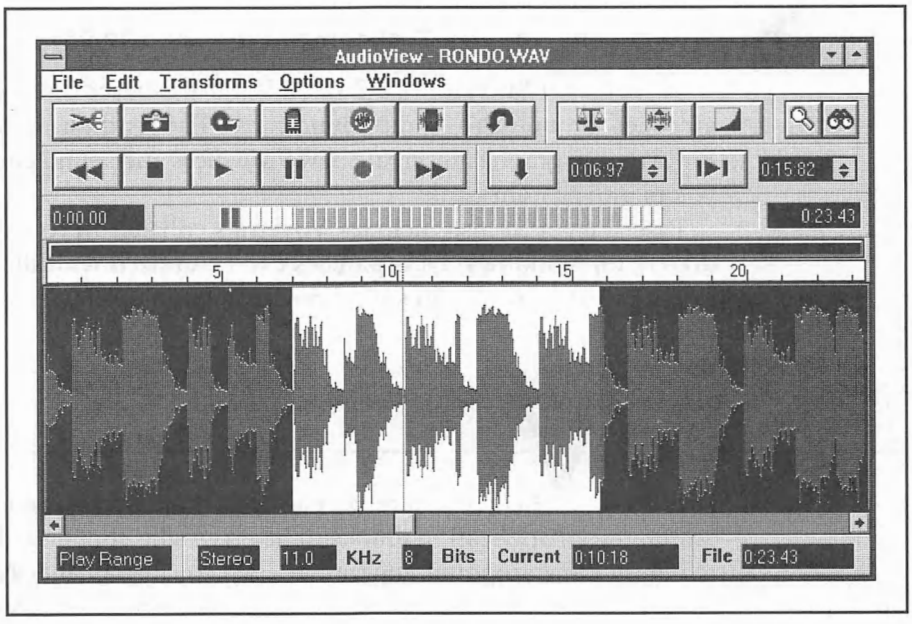
Mr. Sound FX is similar to a limited Whoop It Up! or Wired For Sound Pro, in that you can assign sounds to events such as program launch, moving, or minimizing and maximizing windows. The software also works with Norton's Desktop for Windows and many other Windows applications, including After Dark from Berkeley Systems, Screen Craze from Gold Disk, the Cathy calendar from Amaze, Inc., and others.

AudioView by Voyetra Technologies (Retail: $129.95)

AudioView (Figure 10-23) is a professional-quality graphical digital audio editor for Windows 3.1. It allows you to record, modify, edit, and play back Wave (.WAV) and Voice (.VOC) files with your Pro Audio sound card. You can also enhance these files with special effects such as compression, echo, reverb, sample rate conversion, and more. It features an easy-to-use tapedeck-style transport.

FIGURE 10-23

AudioView by Voyetra Technologies



Multimedia Toolkit by Voyetra Technologies (Retail: $499.95)

Multimedia Toolkit features a special selection of DOS and Windows software and utilities for your Pro Audio sound card, including the following:

- WinDAT is an entry-level digital audio editor for Windows.
- Windows Jukebox allows you to arrange MIDI files, digital audio files, and CD tracks into custom playlists.
- SoundScript is a multimedia scripting language for DOS that allows you to create multimedia presentations combining sound and animation.
- Command Line File players allow you to play MIDI and digital audio from the DOS command line or from batch files.

Multimedia Toolkit includes 10 MIDI files and 10 digital audio files from Voyetra's extensive MusiClips library.

PatchView FM by Voyetra Technologies (Retail: $99.95)

PatchView FM (Figure 10-24) is a Windows-based patch editor and bank arranger for your Pro Audio sound card's FM synthesizer. With PatchView FM, you can graphically create new FM voices and sound effects and arrange voices into custom banks.

PatchView FM also includes Voyetra's enhanced Pro Audio sound card drivers for Windows. New patches can be utilized with the Sequencer Plus series and any Pro Audio sound card-compatible Windows application.

PROGRAMMING TOOLS

Whether you're preparing a multimedia presentation or programming an application that uses the Pro Audio sound card, you may want to obtain some programming tools to help you in your endeavor. This section covers some of the many products available to help the professional accomplish tasks faster, and the amateur to sound like a professional.

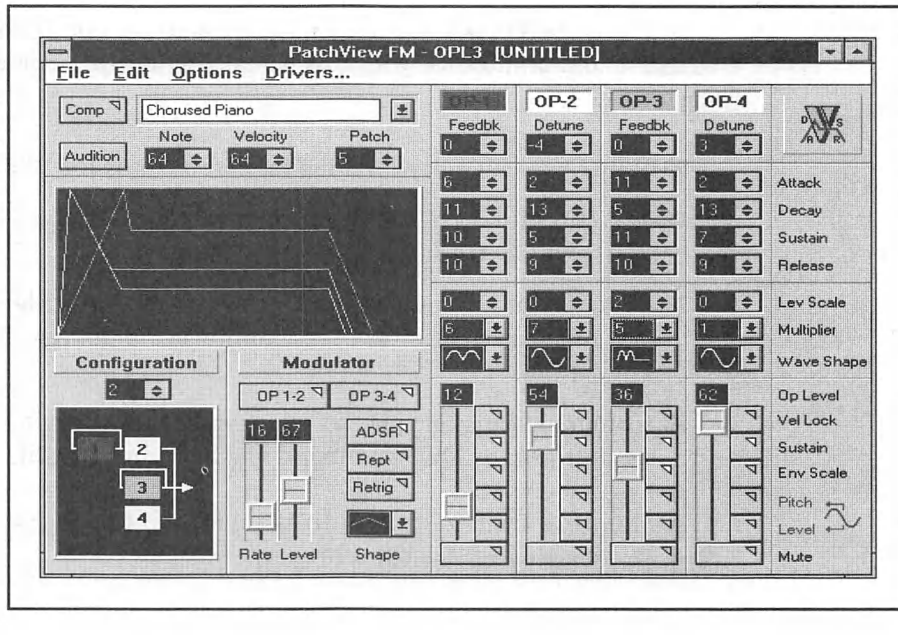


FIGURE 10-24 *PatchView FM by Voyetra Technologies*

DigPak and MidPak by THE Audio Solution (License fees vary from $69.95 to $5,000)

If you're a professional developer or programmer—or even if you're just a budding amateur—and you want to take full advantage of the Pro Audio sound card, then these are the APIs (Application Program Interface) you're looking for. DigPak is a set of TSRs that provides a simple API, through a user interrupt vector, to play 8-bit digitized sounds. C procedures for inclusion with your program are included. Software for compression and decompression of sound files are included as well.

MidPak, on the other hand, provides support for FM synthesis and MIDI music. The MidPak TSR works alone or in conjunction with the DigPak drivers to provide the developer with the complete sound solution. MidPak is a derivative of John Miles's Audio Interface Library, which is used in many games, including Interplay's Buzz Aldrin's Race Into Space, Origin's Ultima Underworld and Strike Commander.

DigPak and MidPak are widely used in the PC game industry. Well-known game publishers like Strategic Simulations, Frontier, Software Toolworks, Electronic Arts, and Spectrum Holobyte, among many others, have embraced these APIs.

DigPak and MidPak are the premier solution for developers requiring music and sound effects in their applications, whether the output medium is the Pro Audio sound card or other sound cards on the market.

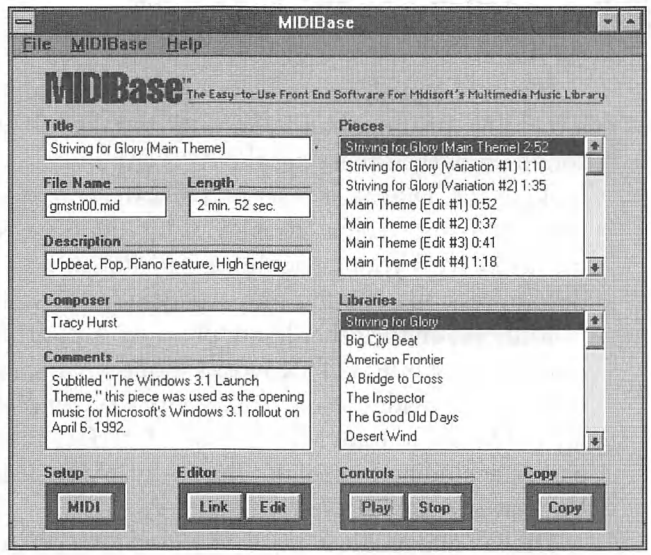
Multimedia Music Library by Midisoft Corporation (Retail: $79.95)

Multimedia Music Library is a compilation of over 100 MIDI format files on floppy disks. The tracks in this collection mainly comprise pop and orchestral music. The 14 main themes, 28 variations, and a wide assortment of snips and backgrounds are all original compositions and can be distributed royalty-free. Since the files are in standard MIDI format, they can be modified with any MIDI sequencer.

A simple interface, MIDIBase (Figure 10-25), facilitates access to these individual files. It stores information about the style and length of each piece. You can review descriptions and then listen to a selection while in MIDIBase. The music is organized into categories consisting of assorted related musical cues grouped around main themes.

FIGURE 10-25

Midisoft Multimedia Music Library MIDIBase



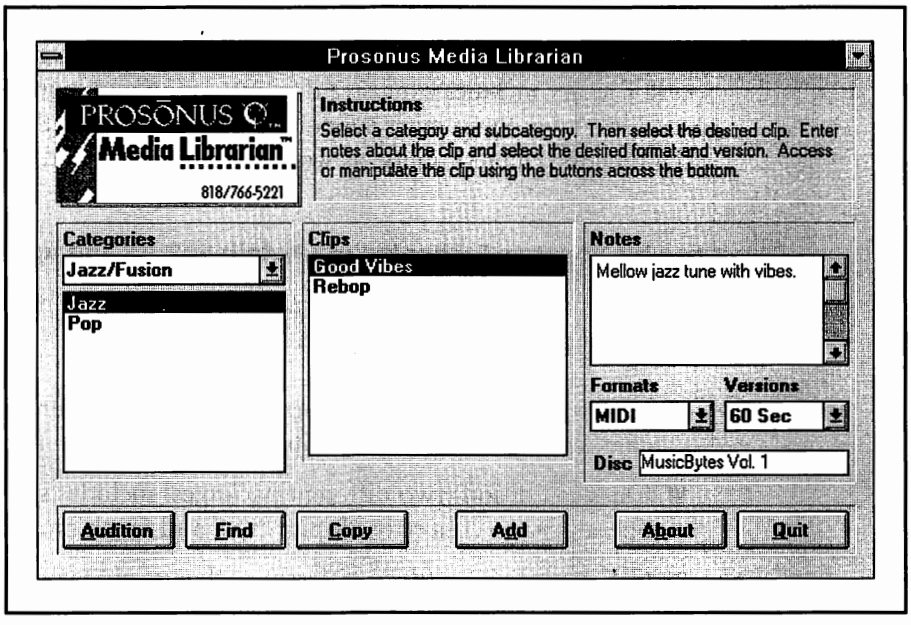
MusicBytes by Prosonus (Retail: $99.95)

MusicBytes (Figure 10-26) contains dozens of original tunes ranging from rock to classical and from industrial to novelty, all kept handily organized by a feature called the Music Librarian. The music and sound effects are designed for use by multimedia software developers and those producing multimedia presentations.

In addition to their varying lengths, each tune is presented in various formats including 11KHz and 22KHz Wave files, 44.1KHz standard Red Book audio, and MIDI sequences. Red Book audio is CD audio; it can be accessed by any standard CD player. Each music clip is available pre-edited in 60-, 30-, 15-, and 5-second versions. The various file formats and lengths are provided to accommodate all PC users, from novice to power user. The Wave format files permit you to edit the music clips to any length, loop a section, or combine other music clips with a Wave format editor such as the Windows Recorder.

Also included in MusicBytes is the Media Librarian, an easy to use software front-end, designed to audition, catalog, customize, and search for files on the CD-ROM. The Librarian allows you to scroll through the files on the CD-ROM and select the desired music or sound effects files. The desired file can then be auditioned without quitting the program. The Librarian also allows you to rename, catalog, and make notes about the files

FIGURE 10-26
MusicBytes by Prosonus



as you wish. In addition, the Librarian features a Find File mechanism that allows you to easily search for a specific file or category of files.

The MusicBytes CD-ROM features performances by numerous world-renowned artists, including Scott Page (Pink Floyd, Supertramp), Jeff Porcaro (Toto, Paul McCartney), Steve Lukather (Toto, Michael Jackson), Neil Stubenhaus (Quincy Jones, Michael Bolton), Jeff "Skunk" Baxter (Doobie Brothers, Steely Dan), and Michael Lang (Barbra Streisand, Lee Ritenour, Neil Diamond).

Music and sound effects on MusicBytes can be used license-free. There are no extra copyright or licensing fees attached to MusicBytes for commercial applications. The tunes and effects on this CD are of consistently high quality and varied selection, and can be highly recommended.

Sound Factory by Voyetra Technologies (Retail: $199.95)

Sound Factory is a complete sound development toolkit that provides DOS applications with a similar level of sound functionality as Windows.

Sound Factory is built around the high-level Voyetra Multimedia Player (VMP) and a set of low-level APIs. This approach allows the programmer to create device-independent applications that support not only the Pro Audio sound card but nearly every major sound card.

Sound Factory contains nearly 100 different functions for MIDI, synthesis, digital audio, audio CD, mixer control, SMPTE synch, timer services, and more. Sound Factory includes extensive documentation with complete function call specifications, programming support files, sample code, digital audio editor, and a function call test utility, as well as sample MIDI and digital audio files.

MusiClips by Voyetra Technologies (Retail: $69.95 and up)

MusiClips is Voyetra's huge library of MIDI files for multimedia productions. Eight packages are available:

- Signatures Edition (three different packages) features styles characterizing different eras in pop music.
- Classics Edition (two different packages) includes symphonies, operas, piano concertos, Joplin rags, and much more.
- Collectors Edition (three different packages) contains popular favorites including ethnic, holiday, patriotic, original production music, and more.

All MusiClips files are specially designed to work with your Pro Audio sound card, and they comply with Microsoft's Multimedia Authoring Guidelines for MIDI files.

COMPELLING CD-ROM TITLES

CD-ROM software contains some of the most exciting multimedia experiences you can have on a PC. The gargantuan capacity of the CD-ROM media allows software designers to cram lots of information onto the disk and enhance them with animation, video clips, and sound. The CD-ROM software programs we describe here were chosen specifically for their applicability to the Pro Audio sound cards. Many other excellent reference titles are not presented in multimedia format but may also be indispensable additions to your CD-ROM library.



NOTE: *Only the night before the final edits of this book were due, we were invited to Media Vision's launching of their multimedia publishing group and their new outstanding multimedia titles on CD-ROM. Two interactive motion pictures, Critical Path and Quantum Gate, looked especially delectable. They both feature real actors, stunning video footage, and lifelike sound. Look for these at your favorite software store.*

Games

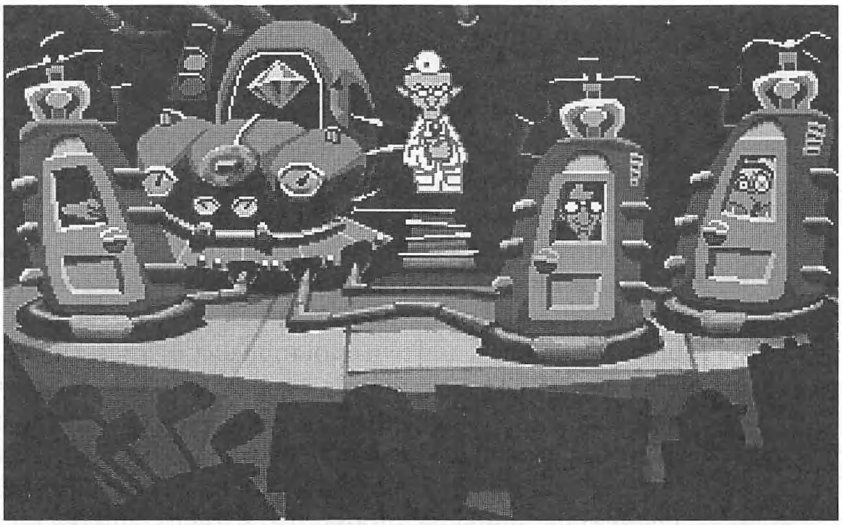
There is little question that games are the most prevalent examples of multimedia applications. This format is most beneficial to adventure games, where dramatic interaction and dialogue with other characters in the gaming environment is the norm.

Recently, one game has been hailed as the mother of all CD-ROM titles. This game is called The 7th Guest from TriloByte. Combining some of the most stunning graphics and animation you'll see on any computer, the game requires you to solve the mystery of a haunted house by solving numerous classical puzzles found in various rooms. The musical score is hauntingly well done and adds much atmosphere to the game. Ghostly apparitions are actually live actors who have been videotaped and digitally manipulated. All the dialogue is also recorded during the actual performance by the actors. The 7th Guest was one of the few games that our non-computer/non-gamer friends wanted to play after seeing the introduction. We bet that this game will sell a lot of CD-ROM drives.

LucasArts has produced some noteworthy disk-based adventure games, but their CD-ROM versions of Day of the Tentacle (Figure 10-27) and Indiana Jones: The Fate of Atlantis are particularly outstanding. The dialogue in both these CD-ROMs is done entirely by a cast of professional voice actors. Richard Sanders, who played Les Nessman in the TV series *WKRP in Cincinnati,* as Bernard in Day of the Tentacle is one of the more

FIGURE 10-27

Day of the Tentacle by LucasArts



recognizable talents used. The music and voices add a very tangible atmosphere and give each character a very distinct and recognizable personality, which is missing in the disk versions of the same games. You don't want to miss either one of these titles.

Sierra On-Line is not about to be outdone in the CD-ROM arena, and both the CD-ROM versions of King's Quest VI and Space Quest IV are excellent, featuring numerous enhancements to the disk-based versions. Sierra also used an established talent to play Alexander in King's Quest VI—Robby Benson, the voice of the Beast in the Walt Disney animated feature *Beauty and the Beast.* If you play King's Quest VI in Windows, you get enhanced high-resolution close-ups of the characters when they are talking. Also, the lip synching technology used here must be seen to be believed. As a bonus, a video for Windows on the making of King's Quest VI is included.

Reference

Plain text can be plain boring—few of us would choose to read a dictionary rather than an illustrated encyclopedia. With a CD-ROM drive and a Pro Audio sound card, you can make any seemingly boring subject come alive with animation, video, and sound. Some reference CD-ROMs are devoid of multimedia enhancements, as they're geared towards professional applications. The ones that are multimedia-enabled are fun to explore, and you may even learn something without realizing it.

Microsoft is a strong supporter of the multimedia concept. They also produce a variety of great multimedia CD-ROM reference titles. One of these is Cinemania (Figure 10-28), a companion for movie buffs. Cinemania contains 19,000 capsule reviews and 750 detailed reviews of movies taken from *Leonard Maltin's Movie and Video Guide.* While you don't get to see movie clips, you do get photographs and sound clips from some of the featured movies. Multimedia Beethoven: The Ninth Symphony is a must for classical music buffs. It is a guide to the composer himself and the Ninth Symphony, of course. Professor Robert Winter, a world-renowned expert on Beethoven, serves as our guide as the symphony is dissected. This CD-ROM helps you learn to appreciate classical music at a new level.

Microsoft Bookshelf Multimedia Edition is a collection of several reference works, which include an encyclopedia, a dictionary, a thesaurus, an atlas, an almanac, and two quotation dictionaries. Here's an example of how learning can be fun. In the atlas, you simply click a country to display its flag and play its national anthem. You even get to hear the names of cities and countries pronounced correctly by simply clicking the name.

Space Shuttle from Software Toolworks is another fine example of a highly entertaining yet informative reference. This reference includes descrip-

FIGURE 10-28

Cinemania by Microsoft



tions of the first 53 Space Shuttle missions, plus actual NASA video footage from these missions. You start at the Johnson Space Center, where you learn the history of the Space Shuttle complete with narration, photographs, schematic diagrams, and full motion video. Explore the equipment and gear used for Space Shuttle missions and discover what it takes to work and live in space. In case you're wondering: yes, the footage of the Challenger disaster is included.

Educational

The sound capabilities of your Pro Audio sound card opens a whole new world of opportunities for non-readers. Pre-readers can be given these software programs to explore on their own without fear of them getting lost. Most of these educational programs are presented in a game format to hold a child's interest a little longer.

Brøderbund is the premier publisher of interactive books on CD-ROM. Just Grandma and Me is Brøderbund's first foray into what they call Living Books. Just Grandma and Me is an adaptation of a Mercer Mayer storybook. Almost anywhere you click on the screen invokes some animation and sound, making it ideal even for pre-schoolers. But the idea is to teach, to help the child read and speak the words on each of the ten pages of the story. The program can read in English, Spanish, or Japanese. Arthur's Teacher Trouble is the follow-up to Just Grandma and Me, and it attempts to teach reading skills in the same vein. Both programs have superb graphics and crystal-clear sound.

Mixed Up Mother Goose from Sierra On-Line is the granddaddy of CD-ROM multimedia entertainment titles. It is an animated adventure where you have to wander around Mother Goose land in the hopes of getting 18 nursery rhyme characters their appropriate missing objects. Once you match the object and the character, they recite and perform a rhyme in either English, French, German, Japanese, or Spanish.

THE SOFTWARE PUBLISHERS

Below is the list of software publishers whose products we've described in this chapter. We didn't include the overwhelming number of software publishers for games, because you're likely to find those in nearly any software or computer store.

Advanced Support Group
11900 Grant Place
Des Peres, MO 63131
Orders Only: (800) 767-9611
Information: (314) 965-5630
CompuServe ID: 70304,3642

Aristosoft
7041 Koll Center Parkway, Suite 160
Pleasanton, CA 94566
(800) 338-2629 (outside California)
(800) 426-8288 (within California)

Berkeley Systems
2095 Rose Street
Berkeley, CA 94709
(510) 540-5535

Blaster Master
Gary Maddox
1901 Spring Creek #315
Plano, TX 75023
CompuServe ID: 76711,547

Blue Ribbon SoundWorks, Ltd.
Venture Center
1605 Chantilly Drive, Suite 200
Atlanta, GA 30324
(800) 226-0212 or (404) 315-0212

Dr.T's Music Software, Inc.
124 Crescent Road, Suite 3
Needham, MA 02194
(800) 989-6434 or (617) 455-1454

Future Trends Software
1508 Osprey Drive, #103
DeSoto, TX 75115
(214) 224-3288

Howling Dogs Systems
Box 80405
Burnaby, BC
Canada V5H 3X6
(604) 436-0420
CompuServe ID: 70044,2736

Ibis Software
140 Second Street, Suite 603
San Francisco, CA 94105
(415) 546-1917

Midisoft Corporation
P.O. Box 1000
Bellevue, WA 98009
(800) 776-6434 or (206) 881-7176

Passport Designs, Inc.
100 Stone Pine Road
Half Moon Bay, CA 94019
(800) 443-3210 or (415) 726-0280

PG Music, Inc.
266 Elmwood Avenue, Suite #111
Buffalo, NY 14222
(800) 268-6272 or (416) 528-2368
CompuServe ID: 75300,2750

Prosonus
11126 Weddington Street
North Hollywood, CA 91601
(800) 999-6191 or (818) 766-5221

Softronics
5085 List Drive
Colorado Springs, CO 80919
(800) 225-8590 or (719) 593-9540

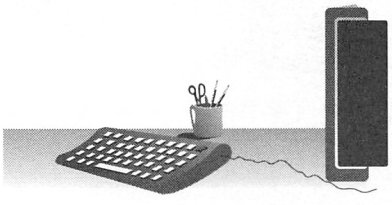
THE Audio Solution
P.O. Box 11688
Clayton, MO 63105
(314) 567-0267

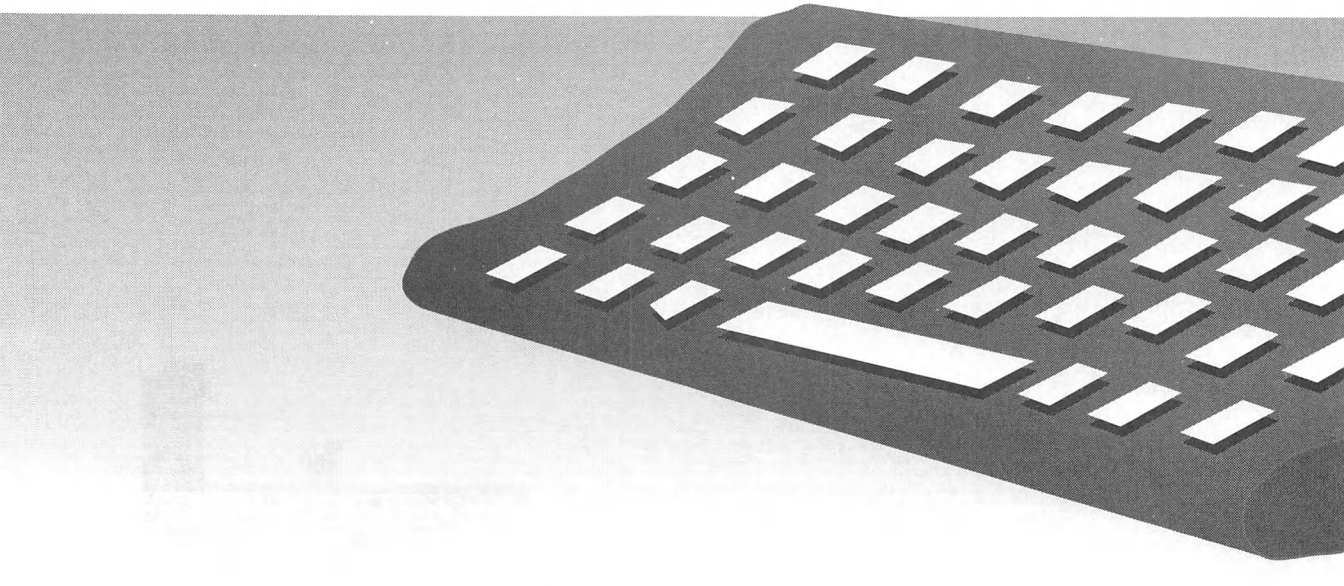
Twelve Tone Systems
P.O. Box 760
Watertown, MA 02272
(800) 234-1171 or (617) 926-2480

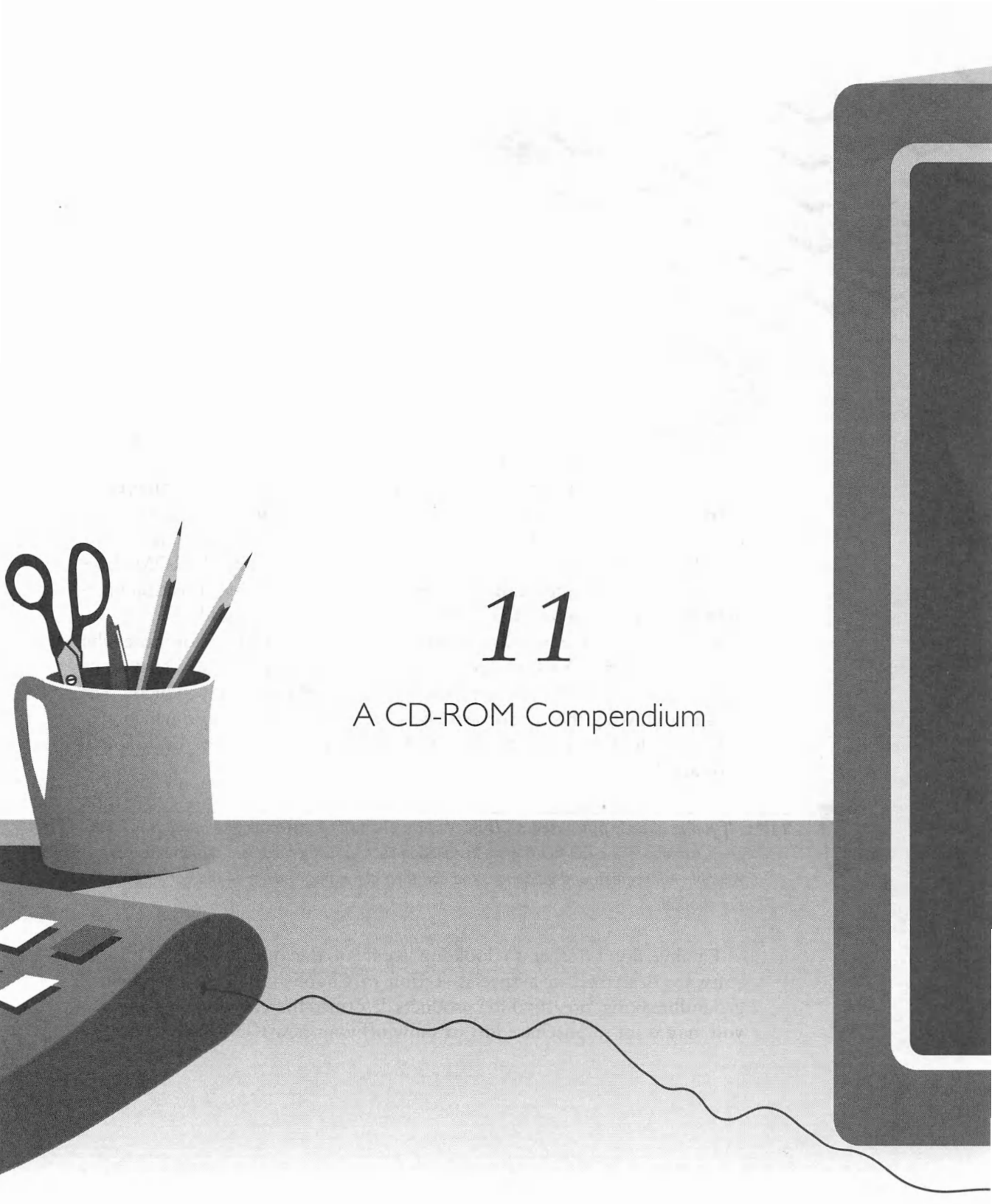
Voyetra Technologies
5 Odell Plaza
Yonkers, NY 10701-1406
(914) 966-0600
CompuServe ID: 71052,2416

WinJammer Software Limited
Dan McKee
69 Rancliffe Road
Oakville, Ontario
Canada L6H 1B1
CompuServe ID: 70742,2052

Software Excitement! (Attn: Registrations)
6475 Crater Lake Highway
Central Point, OR 97502
(800) 444-5457

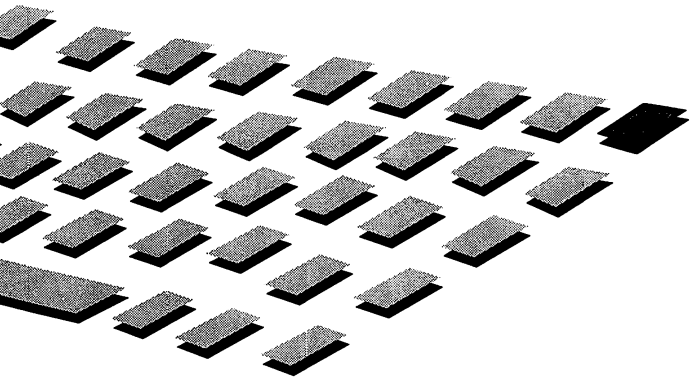






11

A CD-ROM Compendium



CD-ROM (Compact Disc Read-Only Memory) technology can be, and is, in fact, daunting in many respects. We could go on for a whole book regarding the theory and application of digital audio and storage, error correction formulas and methods, signal timing, and—well, you get the idea. Instead, this chapter simply shows you why you want to purchase a CD-ROM drive. You learn what to look for when you go CD-ROM drive shopping—what's important and what's not. Then we have a section highlighting some of the best CD-ROM drives we could get ahold of.

For those of you who will be purchasing a CD-ROM drive, or those who are looking for CD-ROM accessories, we've hunted up and listed some vendors who provide great prices for CD-ROM-related products. The section following the vendor listings is the installation section, which provides some hints on connecting any CD-ROM drive to your Pro Audio sound card and loading the correct driver software.



TIP: *If you've already purchased a CD-ROM drive and will be attempting to install it yourself, jump straight to the CD-ROM drive installation section further along in this chapter for valuable information and guidance. You can then come back and read the earlier part of the chapter.*

Finally, don't forget to look up some of the outstanding CD-ROM software described in a special section in Chapter 10. You'll find some groundbreaking, breathtaking products described there, including a few that you may want to purchase just to show off your new CD-ROM drive.

WHY DO YOU WANT A CD-ROM DRIVE?

Not so long ago, the invasion of the audio CD (Compact Disc) into our living rooms, cars—our everyday lives—began in earnest. Today, virtually everyone has been exposed to the marvelous and seemingly magical little silvery plastic discs. Sales of CDs have long surpassed those of vinyl record albums, and the dollar volume has surpassed that of the analog cassette in recent years. The convenience and sound quality of CDs have been widely accepted as the standard by which both old and new music mediums are judged. Close cousin to the CD is the CD-ROM, poised to extend this popularity to the PC storage arena in a similar vein. Recent software developments, the establishment of new standards, and falling prices are the driving forces behind the widespread acceptance of the CD-ROM as a common storage medium on personal computers.

Software developers are beginning to exploit the capabilities of the medium. Some of them, including Microsoft, Lotus, and Corel Systems, already distribute enhanced versions of popular floppy disk-based products on CD-ROM. Many software publishers are now including their manuals on CD-ROM as well. This not only saves printing costs and materials, it also allows you to find a topic much faster than by flipping through a printed manual.

The razzle-dazzle of multimedia, with its enormous appetite for storage, is another driving force behind this new trend. In fact, many new educational and entertainment titles are appearing on CD-ROM only—they are just too big to fit onto floppies. Voluminous reference materials can now be cheaply stored on CD-ROM. These materials, such as encyclopedias, are being transferred to electronic text format and enhanced with pictures, sound, and video clips. All this is made possible by the advent of CD-ROM technology and your Pro Audio sound card.

A Brief History Lesson

CD technology was first explored in 1974 by both Sony Corporation of Japan and Philips of the Netherlands. By 1976, most other major Japanese electronics companies, including Pioneer, Mitsubishi, and Matsushita, submitted proposals for a digital audio format. The audio CD, as we know it today, was born in 1979 when Sony and Philips collaborated on a standard,

which was accepted in 1980 by a committee of 35 worldwide manufacturers. The commercial introduction of the CD was stalled until *semiconductor lasers,* used for reading the CD, and *large scale integrated (LSI) circuits,* for processing the digital audio data, were ready. So it wasn't until 1982 that the first CD player was released in Japan and Europe and became widely available shortly thereafter in North America.



NOTE: *Although popularly known simply as "CD," audio CDs were officially named "Compact Disc-Digital Audio." Somewhere on the cover, insert, or disc itself, you'll find a stamp or logo with this official name. However, like most everybody else, we refer to these audio discs simply as CDs, or audio CDs.*

The PC industry quickly realized the positive implications of being able to store hundreds of megabytes of information onto a cheap plastic disc. The CD-ROM quickly followed the audio CD. *CD-ROM* describes the computer function of a CD—Compact Disc Read-Only Memory. Unlike a hard disk, data cannot be written or erased on a CD-ROM by the average consumer. Instead, the data is encoded on the CD-ROM during the manufacturing process, as seen in Figure 11-1. The only exception to this rule is the new recordable CD, known as *CD-R* or *CD-WO* (Compact Disc-Write Once), which permits an appropriate recorder to write data—one time only—to a blank CD. The resulting CD can then be read by any CD-ROM drive.



NOTE: *CD-ROM, a read-only storage medium, cannot be infected by a virus. Your computer is also extremely unlikely to contract a virus from a CD-ROM because the manufacturing process has very stringent quality assurance tests.*

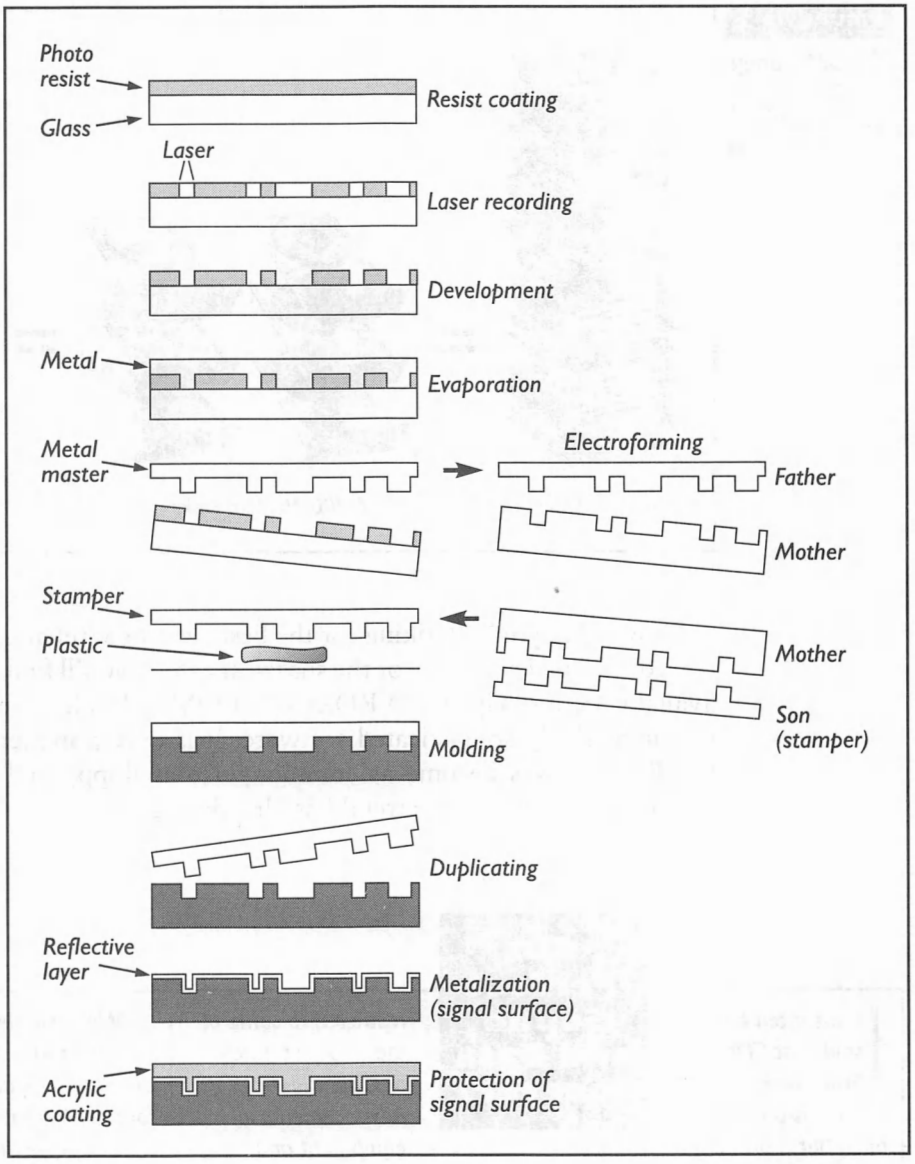
CD-ROM Storage Capacity

A CD-ROM possesses a lot of storage space to fill up, considering the average hard disk is only 120MB in size. A CD-ROM can hold information equivalent to approximately 450 high density 3 1/2-inch floppy disks—that's 450 of the same type of disk that came with this book! (See Figure 11-2.) More than 270,000 pages of uncompressed text can be stored on a CD-ROM. Since the CD-ROM is removable like a floppy disk, it has an unlimited capacity, which is a clear advantage over a hard disk.

Keep in mind that both audio CDs and CD-ROMs refer to identical mediums that store different information for separate applications. All varieties of CDs, except the new recordable CDs, can be produced with the same equipment at the same factories. Despite the myriad of standards in existence, the basic operations in producing and reading data from the silvery

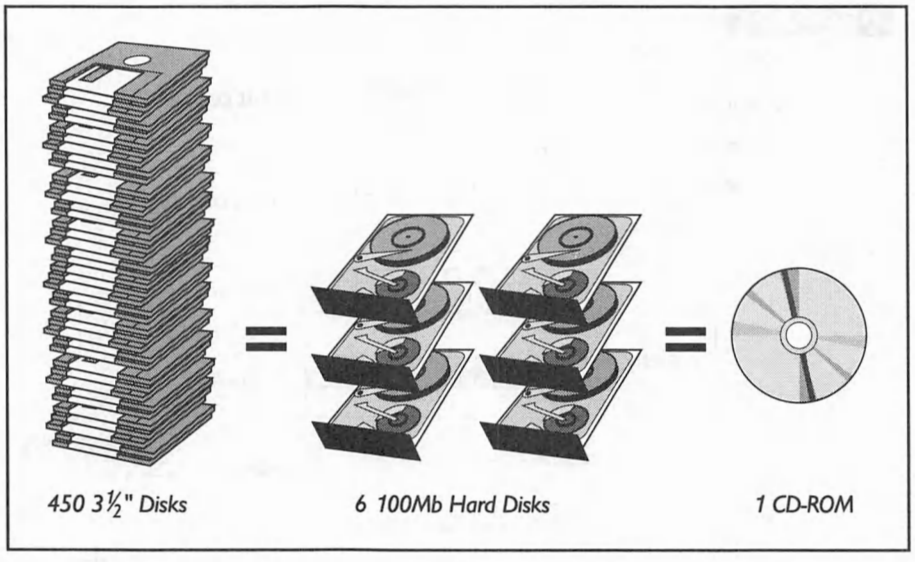
FIGURE 11-1

CD-ROM manufacturing process



discs remain the same. The material required to make a CD-ROM is actually very cheap, so that CD-ROMs are a much cheaper storage medium than the floppy or hard disk. The cost for manufacturing a CD can be as little as $1. Since programs are only getting larger, and floppy disks can cost up to $1 each, you can quickly see why CDs may eventually replace floppy disks as a distribution medium for software.

FIGURE 11-2
CD-ROM storage capacity



So whether you're looking for the best electronic reference data, innovative educational software, or the snazziest games, you'll find the best of them available exclusively on CD-ROM. CD-ROM is the ideal medium to distribute increasingly sophisticated software. It is only a matter of time before CD-ROM drives become as commonplace as floppy and hard drives on personal computers—the trend has already begun.

CD: Perfect Sound and Data Forever?

It has often been said that CDs last forever. Forever is a long time, but a properly cared-for CD will more than likely outlive us. Some of you may have heard the dreaded "CD rot" story, in which some older CDs actually became unplayable due to the deterioration of the reflective aluminum layer. Thankfully, this phenomenon has been restricted to some of the very first batches of CDs. Advancements in equipment and quality assurance have since been made in this process and such complaints are now mostly nonexistent. However, no process is perfect, and there are a very few defective CDs which escape quality assurance and make it to the retail shelf, though this is highly unlikely.

Will a stable and perfected manufacturing process for CD-ROMs mean perfect data forever? Well it really doesn't matter, since the information on most CD-ROMs, unlike that on audio CDs, becomes obsolete within a few years anyway. If data needs to be stored for all posterity, there still isn't a medium that can approach the life span, speed, and convenience of a CD-ROM at anywhere close to its cost.



TIP: *Unlike floppy disks, CD-ROMs are impervious to magnetic fields. You can place them safely next to your monitor or speakers.*

KNOW BEFORE YOU BUY

A smart shopper should always be adequately equipped with a proper understanding of the goods before purchasing. Knowing what to look for and understanding some of the terms used to describe CD-ROM drives and CD-ROM technology are equally important, especially when trying to wade through the ever-changing deluge of products. Besides your budget, due consideration must be given to the following areas whenever you decide to shop for a CD-ROM drive: speed, compatibility, and reliability.

How Fast Is It?

Speed is probably the single most important factor in selecting a CD-ROM drive. The overall performance of any storage device is based on a combination of two measurements: average access time and transfer rate.

Average access time is the more important measurement if you intend to use your CD-ROM drive primarily to access reference material such as magazine article databases or census information. It is less important if the your primary CD-ROM applications involve transferring or reading large megabyte-sized files. In these instances (multimedia CD-ROMs fall into this latter category) the transfer rate, rather than the access time, is the more important criteria.

Average Access Time

Average access time, or *average seek time,* is a measurement of how fast a drive can position its reading assembly, read the data off any part of the disc, and return it to the computer. Average access time is measured in thousandths of a second, or *milliseconds* (ms). The assembly takes slightly longer to move from the outermost to the innermost edge of the disc but is a little quicker to move just to an adjacent section of the disc. A CD-ROM drive has to brake and accelerate frequently as data is read from different parts of the disc, just as a car needs time to accelerate to a faster speed or brake to slow down. Any motor requires time to stabilize at any given speed.

This speed adjustment, in combination with the comparatively bulky reading assembly, accounts for the slow access times of CD-ROM drives.

All measurements are relative; that is to say, you should only compare seek times among CD-ROM drives. Anything faster than 300ms is currently considered state of the art. Also bear in mind that you will have an impossible time telling the difference between an average access time of 280ms versus one of 265ms. You're more likely to tell the difference between one with 350ms and one with 200ms. First-generation CD-ROM drives had access times of over one second (1,000ms). In comparison, when the hard disk drive was first introduced on a PC, it had an average seek time of about 90ms. The fastest CD-ROM drive at the time of this writing is the Toshiba 3401 series, with an average access time of 200ms. This is leaps and bounds better than the first generation CD-ROM drives but is still a slowpoke compared to today's sub-16ms hard disks.

CD-ROM drives are abysmally slow in comparison to hard disk drives. However, this is easily offset by the CD-ROM's large storage capacity at a much lower cost. Fortunately, CD-ROM drives are faster than floppy disk drives.



NOTE: *While a CD-ROM costs very little to make, the information and programs contained on it probably cost far, far more to gather or create. The information is what you're paying for when you buy a CD-ROM, not the physical CD-ROM itself.*

Transfer Rate

Transfer rate is perhaps the most important measurement for multimedia compatibility of a CD-ROM drive, including most, if not all, educational and entertainment CD-ROM programs. Unlike searching for many snippets of information that may reside on different areas of a disc, multimedia applications usually need to transfer large amounts of text, audio, and video data to the computer contiguously. The faster this process can proceed, the higher the number of video frames that can be transferred and displayed within a second. Fast throughput can be used to transfer better-quality audio and also translates to smoother video, more detailed images, more colors, and more realistic animation.

The *transfer rate* measures the speed at which the CD-ROM drive can read data off the disc and transfer it to the computer once the laser assembly has positioned itself onto the desired track. Transfer rate is not affected by average access time, as this measurement is taken after the seek has occurred. Transfer rate is measured as the number of kilobytes that can be transferred in a second, or *KB/sec (kilobytes per second)*.

As a minimum, all CD-ROM drives are supposed to transfer data at 150KB/sec. Since this is a standard, we would assume that all CD-ROM drives adhere to this minimum transfer rate, but such is not the case. Initially, a variety of software and hardware bottlenecks prevented the drive from actually transferring data to the computer's memory at that rate. The solution came in the form of some software changes and a RAM (Random Access Memory) buffer built into the CD-ROM drive itself. With these changes, data could be read into the *RAM buffer,* which acts as a temporary holding place for the data, while other data is being transferred to the computer. This process is somewhat similar to airplanes holding on the apron prior to take-off on the runway—the RAM buffer is equivalent to the airport apron.

It is pretty common for CD-ROM drives of today to use a buffer to smooth and speed up the transfer rate. Buffer sizes typically range from 32KB to as much as 256KB. Keep in mind that the buffer size really doesn't mean too much as a specification—ultimately a drive with a 64KB buffer and a 300KB/sec transfer rate is still faster than one with a 256KB buffer and a 150KB/sec transfer rate.

Double-Speed Drives

A relatively simply technical innovation was developed to improve the transfer rate of CD-ROM drives. Manufacturers and software programmers quickly recognized that a 150KB/sec transfer rate is completely inadequate to fill the screen with digital high-resolution color video displayed at 30 frames per second (fps), the speed adopted as the minimum requirement for the Multimedia PC (MPC) Level 1 standard. In the so-called double-speed drives, the rotational speed of the disc is doubled. Increasing the rotational speed of the disc results in an increase in the transfer rate. When the computer is accessing data, the drive spins a CD-ROM anywhere from 400 to 1,060 rpm (revolutions per minute). Since the disc is spinning two times faster than normal, twice the number of sectors containing data pass over or under the reading assembly at any given time. This increased rotational speed effectively doubles the transfer rate of the drive from 150KB/sec to 300KB/sec.

Double-speed drives technically conflicted with the audio CD standard, which specifically called for a 150KB/sec transfer rate. Therefore, all faster CD-ROM drives automatically slow down to normal speed when playing a regular audio CD. This was done to maintain compatibility with the standard audio CD DAC (digital-to-analog converter), which only accepts data at 150KB/sec. In contrast, data such as video, pictures, and text bypasses the CD-ROM DAC and audio circuitry and is transferred directly to the CD-ROM drive's RAM buffer, then on to the computer (see Figure 11-3).

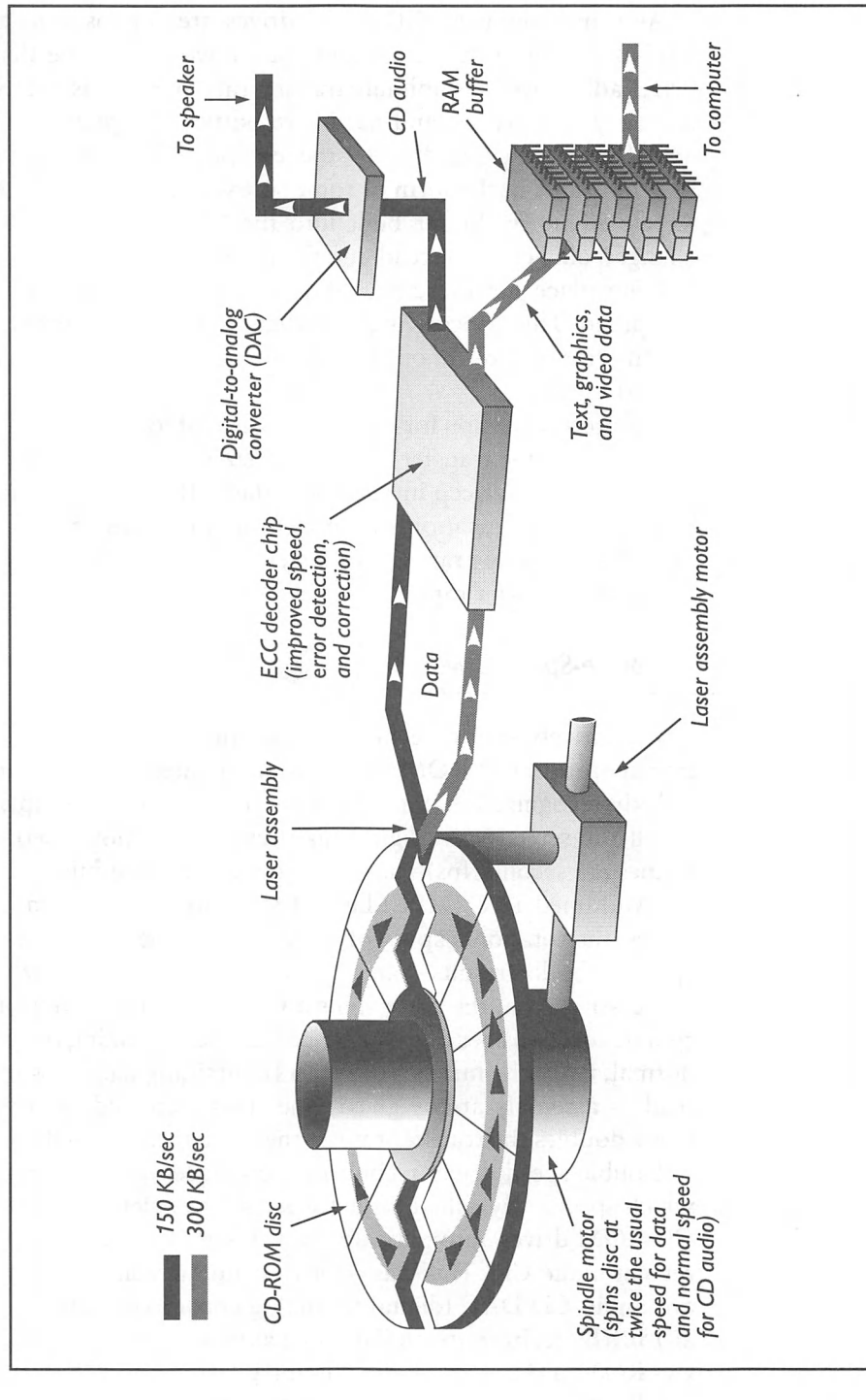


FIGURE 11-3

The data path in a double speed CD-ROM drive



NOTE: *Some drive manufacturers are trying even harder to speed up their CD-ROM drives beyond double speed—Toshiba and Texel increased the rotational speed of their drives to 2.2 times normal for a transfer rate of 330KB/sec and 335KB/sec, respectively. Pioneer pushed the envelope further by speeding up the rotational speed of their 604X CD-ROM Changer by four times, thus increasing the transfer rate to a speedy 612KB/sec! This technology, dubbed Quadraspin by Pioneer, is no doubt the next frontier for other CD-ROM drive manufacturers.*

You should seriously consider purchasing at least a double-speed CD-ROM drive if you plan to use any multimedia software in the foreseeable future. While they may cost more than a standard-speed drive, you more than recoup the difference in price in the long run. Double-speed drives are already at a reasonable price. These prices will erode even further as many manufacturers prepare for the next salvo—the triple- and quadruple-speed CD-ROM drives.

How Compatible Is It?

The first compatibility issue you should concern yourself with is whether the CD-ROM drive is compatible with your Pro Audio sound card's SCSI (Small Computer Systems Interface) CD-ROM interface. Secondly, software compatibility has become increasingly important as the proliferation of CD standards continue at a brisk pace. Fortunately, there are only a few software standards you must keep in mind when selecting a CD-ROM drive. These standards usually mandate a variety of minimum hardware performance requirements. Most newer CD-ROM drives already adhere to or surpass these standards—the ones in our survey do. The two standards you may not want to do without are the MPC (Multimedia Personal Computer) certifications and Kodak Photo CD compatibility on your CD-ROM drive.



NOTE: *Adherence to any standard is important only if you are going to utilize CD-ROMs that require that particular capability. Currently, the most popular standard for the PC is the MPC standard. Even if your current applications do not require MPC compliance, it is likely that a future upgrade will.*

Pro Audio CD-ROM Interface Compatibility

When you're looking for a CD-ROM drive, you should be on the lookout for one you can hook up directly to your Pro Audio card. You could purchase one that has its own controller, but you're now paying for a second controller, since one comes built-in with the Pro Audio sound cards. You

also use up an additional slot in your computer, which you'll probably need some day.

The Pro Audio sound card includes a SCSI interface that is ideal for hooking up a CD-ROM drive. The Pro Audio's SCSI interface can transfer data at a maximum rate of 690KB/sec, so it can readily handle even the fastest CD-ROM drive in production today. SCSI is the best CD-ROM interface, as the latest technology is usually first implemented in SCSI versions of CD-ROM drives and you can find a variety of such drives on the market. Refer to Figure 11-4 for a list of CD-ROM drives that are compatible with your Pro Audio card.



TIP: *The CD-ROM drive list was current at the time of writing. If a newly introduced drive is not listed, check with Media Vision for the latest list.*

A CD-ROM drive is only one of the many SCSI-compatible devices you can connect to the Pro Audio sound card. Refer to Appendix C for a discussion of SCSI and SCSIworks!, a software package that allows you to connect scanners, hard drives, tape drives, and more to the Pro Audio SCSI interface.

MPC Level 1 and Level 2 Standards

The Multimedia Personal Computer (MPC) standard was created by the MPC Marketing Council. The council consists of, and was formed by, a number of hardware and software vendors including Microsoft and Media Vision, to establish and license a standard that specified the minimum requirements for a PC to be considered multimedia-ready. The standard includes specifications for a PC, a sound card, a CD-ROM drive, speakers, and Microsoft Windows.



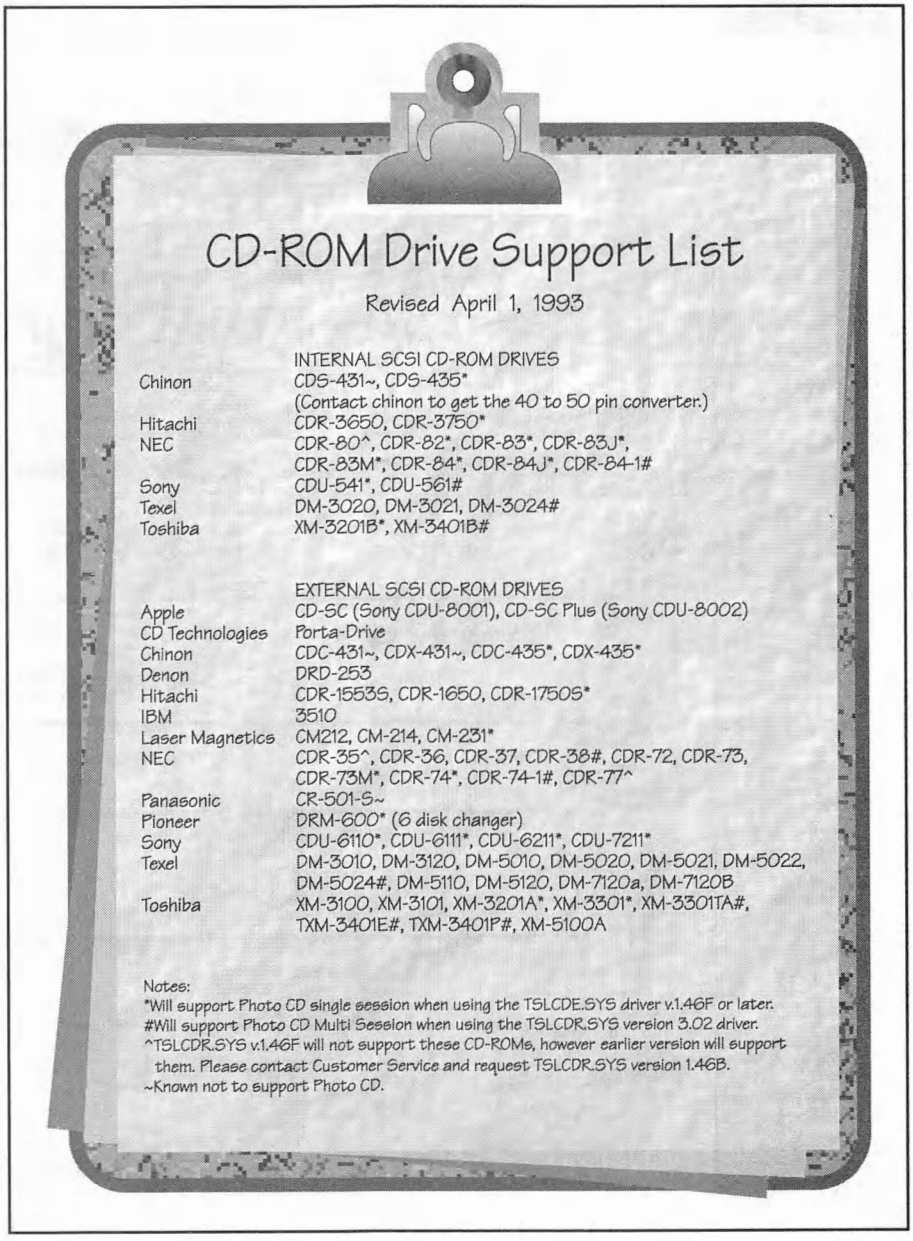
NOTE: *This chapter is only concerned with the MPC requirements for CD-ROM drives. Chapter 1 contains a complete discussion of the MPC standards.*

The MPC logo is licensed only to hardware companies that provide complete upgrade kits, and to software companies whose software requires an MPC-compliant computer to run on. It is unlikely that you'll see the MPC logo if you're purchasing a CD-ROM drive separate from the other components like a sound card. However, a CD-ROM drive does have to meet certain minimum criteria to qualify as an MPC-compliant drive.

There are currently two levels or standards that have been established by the council: MPC Level 1 and MPC Level 2. Figure 11-5 shows the CD-ROM

FIGURE 11-4

A list of CD-ROM drives compatible with the Pro Audio sound cards



CD-ROM Drive Support List

Revised April 1, 1993

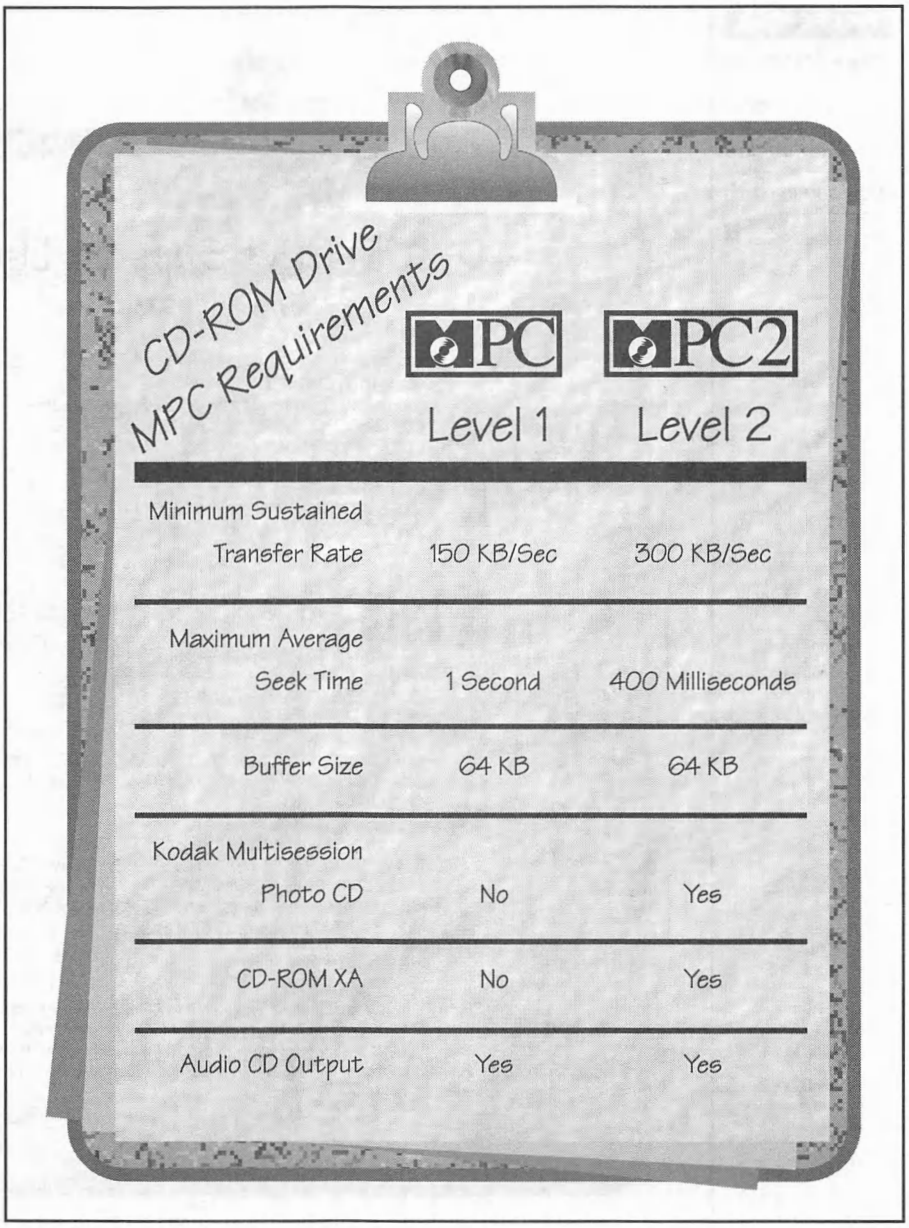
	INTERNAL SCSI CD-ROM DRIVES
Chinon	CDS-431~, CDS-435*
	(Contact chinon to get the 40 to 50 pin converter.)
Hitachi	CDR-3650, CDR-3750*
NEC	CDR-80^, CDR-82*, CDR-83*, CDR-83J*, CDR-83M*, CDR-84*, CDR-84J*, CDR-84-1#
Sony	CDU-541*, CDU-561#
Texel	DM-3020, DM-3021, DM-3024#
Toshiba	XM-3201B*, XM-3401B#

	EXTERNAL SCSI CD-ROM DRIVES
Apple	CD-SC (Sony CDU-8001), CD-SC Plus (Sony CDU-8002)
CD Technologies	Porta-Drive
Chinon	CDC-431~, CDX-431~, CDC-435*, CDX-435*
Denon	DRD-253
Hitachi	CDR-1553S, CDR-1650, CDR-1750S*
IBM	3510
Laser Magnetics	CM212, CM-214, CM-231*
NEC	CDR-35^, CDR-36, CDR-37, CDR-38#, CDR-72, CDR-73, CDR-73M*, CDR-74*, CDR-74-1#, CDR-77^
Panasonic	CR-501-S~
Pioneer	DRM-600* (6 disk changer)
Sony	CDU-6110*, CDU-6111*, CDU-6211*, CDU-7211*
Texel	DM-3010, DM-3120, DM-5010, DM-5020, DM-5021, DM-5022, DM-5024#, DM-5110, DM-5120, DM-7120a, DM-7120B
Toshiba	XM-3100, XM-3101, XM-3201A*, XM-3301*, XM-3301TA#, TXM-3401E#, TXM-3401F#, XM-5100A

Notes:
*Will support Photo CD single session when using the TSLCDE.SYS driver v.1.46F or later.
#Will support Photo CD Multi Session when using the TSLCDR.SYS version 3.02 driver.
^TSLCDR.SYS v.1.46F will not support these CD-ROMs, however earlier version will support them. Please contact Customer Service and request TSLCDR.SYS version 1.46B.
~Known not to support Photo CD.

drive requirements for both levels. The main difference between the two is performance—the Level 2 specifications require faster and improved hardware over Level 1. You should also note that when Level 1 was first adopted, the standard specified a minimum of a 80286/12MHz computer. The

FIGURE 11-5 *MPC Level 1 and Level 2 specifications for CD-ROM drives*



council, upon realizing that the hardware platform was inadequate, later upped the minimum requirements to a 80386SX/16MHz computer.

MPC Level 2 was introduced in May, 1993 to keep up with the growth in hardware capabilities. This specification for the next generation of

multimedia PCs was designed to allow for the playback of a video clip in a 320 × 240 window at 15 fps. The key difference as far as the CD-ROM drive is concerned is that Level 1 required a sustained transfer rate of 150KB/sec, while Level 2 requires at least a double speed drive with a sustained transfer rate of 300KB/sec. MPC Level 2 is fully backward compatible with MPC Level 1, meaning Level 2-compatible equipment works properly with CD-ROMs designed for Level 1 systems.



NOTE: *You should be aware that until recently, the MPC Council did not actually test the products before certifying them—the certification was strictly based on the manufacturers specifications and their ability to pay a fixed fee for the logo usage. This all changed in May, 1993 when the Level 2 specification was approved. Now, all members have to submit their products to the council for testing. The MPC standard has become a stamp of certification which makes it more valuable than before.*

Kodak Photo CD

The Kodak Photo CD standard is gaining in popularity and momentum—you may want to make sure the CD-ROM drive you purchase has the capability to use discs of this format. Photo CDs can be filled up with photographs in one pass, thus making them *single-session*. Discs can also be appended to—you can have photographs added to a Photo CD that is not full. This creates a *Multisession Photo CD*.



NOTE: *The MPC Level 2 specifications require Kodak Multisession Photo CD compatibility.*

Since the new standard was not clearly defined at first, the early CD-ROM players to claim Kodak Photo CD compatibility could only play back a single-session photo CD. Adapting older non-Kodak Photo CD compatible drives for single-session compatibility typically just involved a software driver update. However, this is not the case for multisession compatibility. At the very least, a firmware change—requiring replacement of some chips in the drive—and a software driver update is required. Some manufacturers offer a trade-in program for those customers who need multisession capability. This trade-in involves returning the old drive and paying an additional fee in exchange for a completely new model.

Most, if not all, of the newly introduced CD-ROM drives now include Kodak Multisession Photo CD compatibility as a standard feature. It never hurts to check, though, before putting down your hard-earned cash for a CD-ROM drive.

How Reliable Is It?

The early proponents of CD technology argued that this technology would guarantee perfect sound (or data) forever. Reality has proven otherwise, as usual—CDs can be rendered unreadable or unreliable without proper maintenance and care. Certain aspects of the reliability of the medium can be attributed to the CD-ROM drive itself. After all, you can't possibly read a perfectly healthy disc in a broken CD-ROM drive.

Keeping the Data Safe

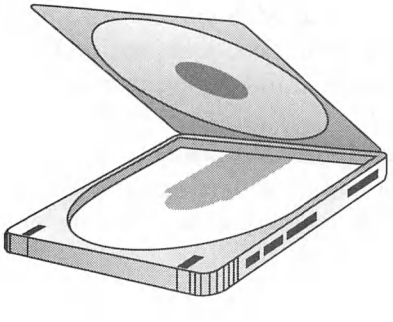
Many consumers have been led to believe by early CD zealots that the CD is indestructible and immune to fingerprints and scratches. This is far from the truth. While a CD or CD-ROM is less susceptible to damage by fingerprints and scratches, a very dirty or scratched disc can become unreadable. Less damaging fingerprints and light scratches can force the drive to re-read the disc several times before it successfully reconstructs the data, causing delays.



NOTE: *It is okay to leave a CD-ROM in the drive when you're not using it. The disc may become warm to the touch when you remove it from the drive after an extended period of time. This is normal and does not jeopardize the disc in any way.*

It is no wonder, then, that instructions included with nearly all CDs and CD-ROMs advise proper handling and cleaning of the disc to keep its shiny surface clean. Handle all CDs and CD-ROMs by their edges to prevent leaving an oily fingerprint on the discs. If you have to put the disc down for a moment, make sure the shiny side faces up and the label side is down.

The disc caddy (or CD caddy) and the dust door are two devices designed by CD-ROM drive manufacturers to counter the dust and fingerprint problems.



DISC CADDY Regular audio single-CD players use a tray or top loading mechanism to "cradle" or load the CD (multidisc players may use a different mechanism). The disc caddy, shown here, is the more popular method among CD-ROM drives. Most of the CD-ROM drives in our informal survey later in this chapter use the CD caddy. It looks like the plastic storage case that most CDs come in, except it has a metal gate on the bottom that opens up when inserted into the drive

so that the laser in the reader assembly can read the shiny disc surface. First developed and used by Sony, these plastic caddies serve the primary function of protecting the disc from dust, fingerprints, and scratches by isolating them from direct handling. You first load the CD-ROM into a CD caddy, then load the caddy containing the disc into the drive.

One of the drawbacks to the CD caddy is that changing discs in the caddy is inconvenient and awkward. The simple solution to this problem is to purchase additional caddies for every CD-ROM that you own. This may seem expensive (at $7 to $15 per caddy), but it is the best solution if you change discs frequently. Tray-or top-loading drives are easier in this respect, but they expose your discs to dust and fingerprints.

All of the high-end and most of the midrange drives use the CD caddy. Only a handful of drives on the low end use an alternate method to load a disc. The multidisc Pioneer DRM-604X in our survey uses a unique disc magazine to hold up to six CD-ROMs in the drive at once.

DUST DOORS AND LENS CLEANERS Many CD-ROM drives incorporate dust doors to supplement the caddy in keeping grime and dust away from the CD. These dust doors remain closed whether or not a disc is in the drive. They are extremely important, especially if the drive is to be used in a dusty environment, such as a workshop, basement recording studio, or automobile repair garage. NEC actually included two dust doors on the CDR-74 and CDR-84 drives to further improve its immunity to dust.

Some drives also include an automatic lens cleaner that cleans the lens (through which the laser beam is projected) of the laser assembly whenever a disc is ejected. Since the laser beam must pass through this focusing lens, it must be clear of dust or other contamination. Otherwise, the drive has a hard time reading the data off the disc, much like dust and fingerprints on a camera lens would blur or obscure the subject in a photograph.

Many early CD-ROM drives that didn't have these doors or an automatic lens cleaner became unreliable without constant cleaning. Both a dust door and an automatic lens cleaner are useful features.

Drive Failures

Even the best mechanical devices are bound to fail eventually. CD-ROM drives are sophisticated mechanical devices that can be costly to repair when broken. Manufacturers attempt to give you an idea of the reliability of their drives by providing an MTBF (Mean Time Between Failure) specification. They also provide varying warranty periods and various levels of technical support for their CD-ROM drives.

MTBF (MEAN TIME BETWEEN FAILURES) *MTBF* is a measurement that indicates approximately how long any CD-ROM drive operates on average before it fails. Although it is a measurement that is emphasized by manufacturers, it can be generally ignored. This would be a useful measurement if an independent certification lab faithfully compared the drives and rated each by its MTBF, but unfortunately, each manufacturer uses its own standards instead. Therefore, comparing MTBF claims by different companies is like comparing apples and oranges.

WARRANTIES A good warranty period, on the other hand, is important. A one-year warranty is the industry standard, but some manufacturers, notably NEC, offer two-year warranties on their CD-ROM drives. Since CD-ROM drives are expensive to replace (unlike a floppy disk drive) and are generally more sensitive to damage than hard disks, a longer warranty ensures that costly repairs, when needed, will be covered by the manufacturer.

TECHNICAL SUPPORT AND UPGRADES The quality of technical support is also important, especially if you run into difficulties with your CD-ROM drive either during or after installation. Upgrade policies are another important consideration. Some companies will upgrade an older drive to give it new capabilities. Others have liberal and reasonable policies regarding upgrades to future products with added capabilities. This type of policy proved invaluable to those who took advantage of the offer from some manufacturers to upgrade their drives from single-session compatibility to Kodak Multisession Photo CD compatibility.

MAKING A PURCHASE DECISION

To many of you, cost is the primary consideration. Buy the best and the fastest drive you need for your application. If you're planning to use mainly textual reference material such as a dictionary or phone directory, the cheapest drive in the following survey will suffice. However, if you want to run some of the hottest multimedia titles (like most educational and entertainment programs) and even better ones to be introduced in the future, you'll want to get the fastest drive possible. Hold off if your budget doesn't permit at least an MPC Level 2 compatible CD-ROM drive; prices will only drop, and buying a slow drive is like pouring money down the drain if it will not run the type of programs you want. It is a good idea to test any intended application with the drive before purchasing it, just like testing a prospective CD player by bringing and playing your favorite CD at the store. Or you can purchase the drive from a store with a money-back guarantee.

If you haven't purchased either a sound card or a CD-ROM drive, consider purchasing a Media Vision multimedia upgrade kit. The multimedia upgrade kit is usually more cost effective and is a better value because it contains all the necessary cables, connectors, software drivers, and instructions required to hook up the drive to the Pro Audio card. The kits also include a number of CD-ROM programs to get you started with your CD-ROM collection. These items, when purchased separately, certainly cost much more than the price of the kit.

Purchasing a Media Vision multimedia upgrade kit is not a viable option if you've decided on a CD-ROM drive that is not currently being bundled with the kits. In that case, you may want to look at a third party bundle that includes a Pro Audio card. Companies such as Sony and Texel frequently bundle Pro Audio sound cards with their CD-ROM drives.



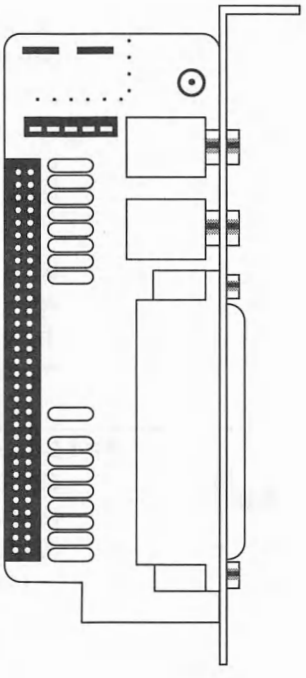
NOTE: *Although Media Vision sells complete multimedia upgrade kits that include both a CD-ROM drive and a Pro Audio sound card, they do not sell CD-ROM drives separately. If you already own a Pro Audio sound card, you will have to look elsewhere to purchase a CD-ROM drive. Once you have a CD-ROM drive, you can obtain the necessary cables and driver software directly from Media Vision. Check Appendix A for a rundown of which drives are included with the variety of Media Vision bundles.*

As you can see, there are many ways to go about getting the combination you're after. As a general rule, for those of you who do not already own a sound card, decide on which CD-ROM drive you want first, then go shopping for a multimedia bundle that includes the Pro Audio sound card as well. Refer to "Finding the Bargains" later in this chapter for vendors.

The Right Connection

Many of you may have a high-speed SCSI adapter that is used for a hard disk in your PC. You may wonder whether to hook the CD-ROM drive to that adapter or to the slower Pro Audio SCSI port. You won't see a big performance difference, if any, between hooking the drive up to either card. The Pro Audio SCSI port is fast enough to handle even the fastest CD-ROM drive transfer rate for the foreseeable future. Our informal testing did not indicate, nor could we determine, any differences between hooking up a CD-ROM drive to the Pro Audio SCSI port versus hooking it up to a separate high-speed SCSI adapter. Keep in mind that while the Pro Audio CD drivers are free, drivers for the other SCSI adapter may bear an additional cost.

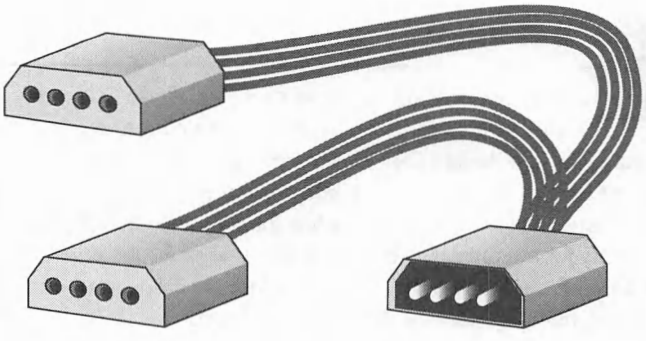
Internal or External?



You have to decide whether to get an internal or external CD-ROM drive. An external drive requires a separate case and power supply, as well as an empty slot on the back of your computer. The empty slot is taken up by a special adapter from Media Vision, which makes the Pro Audio's internal SCSI port accessible from outside the computer. The back plate to which the external CD-ROM drive connects is shown here.

An external drive also means extra cables hanging off the back of the computer and an extra power cable that needs to be plugged into an AC outlet. However, the installation for an external drive can be much simpler than for an internal drive. An external installation also provides an opportunity to place the drive within easy reach; this is especially useful if your computer is hidden away underneath the table, or out of arm's reach. External drives typically cost more—$50 to $200—than their internal counterparts because it costs more to provide the required extra case and power supply. External CD-ROM drives can prove to be more flexible and can provide you with more expansion choices in the long run, though you may have to sacrifice some desktop real estate to house them.

An internal drive requires at least a half-height 5 1/4-inch drive bay and a free disk drive power connector inside your computer. The installation is a little bit more involved, as you may have to temporarily remove other drives from your computer to make extra room for installing the CD-ROM drive.



If you don't have any extra power connectors, you also need to get a power connector splitter, like the internal Y-splitter shown here, from a local dealer. Selecting an internal drive might severely limit your options for adding SCSI devices (as discussed in Appendix C) to your Pro Audio SCSI port later on. However, an internal CD-ROM drive does cost less than an identical external one.



TIP: *Before you decide which CD-ROM drive (internal or external) to purchase, seriously consider whether you're going to add other SCSI devices to your Pro Audio SCSI port. Adding external devices is easier than adding internal devices. For instance, if you plan to hook up a SCSI scanner or an external removable drive (such as a Syquest or Bernoulli) to the Pro Audio card, you should purchase an external CD-ROM drive.*

Finding the Right Cables and Connectors

Check with the following tables for items that you need for a complete CD-ROM drive installation. An item you cannot do without is the CD-ROM cable/driver kit from Media Vision. If you have a modem, the CD-ROM drivers are available for free either from Media Vision's BBS or the Media Vision forum on CompuServe. If you obtain the drivers in this manner, you'll have to purchase the required cables separately; the kit from Media Vision includes all the necessary cables.

If you're buying an internal CD-ROM drive, you need a cable kit from the ones in the table below, which includes the driver software and all necessary cables.

Cable Kit (choose one only)	Part Number	Price + Shipping
SCSI CBL/DRV Kit Internal—Hitachi	830-001901	$15 + $7
CBL/DRV Kit Internal—Mitsumi	830-001101	$15 + $7
SCSI CBL/DRV Kit Internal—NEC	830-000701	$15 + $7
SCSI CBL/DRV Kit Internal—Sony	830-000201	$15 + $7
SCSI CBL/DRV Kit Internal—Texel	830-000302	$15 + $7
SCSI CBL/DRV Kit Internal—Toshiba	830-000401	$15 + $7

You can also choose to purchase the individual cables separately. Do this only if you already have one or two of the items; otherwise, it's cheaper and better to just get the whole cable and drive kit from the preceding table.

If you want to purchase the cables separately, you need the following items.

- CD-ROM drivers (P/N: 558-0007 at $9 or download from BBS/CompuServe).
- A 50-to-50-pin SCSI ribbon cable (P/N: 829-0006 at $11—which may have been included with your CD-ROM drive).
- One audio cable (can be shipped U.S. Mail) from the table on the next page.

Audio Cable (choose one only)	Part Number
NEC internal	829-0007
Sony internal	829-0002
Texel internal	829-0003
Toshiba internal	829-0004

In addition, you may need a power connector splitter, like the one pictured earlier, if you're out of free power connectors.



NOTE: *Because there is no standard for audio connectors on the back of CD-ROM drives, making a single internal CD audio cable for the Pro Audio sound cards isn't possible. You must either buy one from Media Vision, or make one.*

If you're adding an external CD-ROM drive, you just need the external cable/driver kit (P/N: 670-0003-01; $29 plus $7 shipping). This kit includes the CD-ROM drivers, a 50-to-50-pin SCSI ribbon cable, a 25-to-50-pin SCSI cable, dual RCA phono-to-1/8-inch mini jack cable, dual RCA phono-to-dual RCA phono cable, and an external CD-ROM bracket adapter. The external CD-ROM bracket adapter, pictured earlier, is unique—you can find it only from Media Vision, and it is sold only as part of the external cable/driver kit.

A Selection of CD-ROM Drives

Almost any CD-ROM drive with a SCSI interface can be used with the Pro Audio card. SCSI is the most common interface for a CD-ROM drive, with a wide variety to choose from.



TIP: *Refer to Figure 11-5 for a complete list of CD-ROM drives that are compatible with the Pro AudioSpectrum card.*

The following is a select compilation of some of the most readily available and best performing CD-ROM drives currently on the market. Any of them can be easily attached to the Pro Audio SCSI interface and is supported by the free CD-ROM driver software provided by Media Vision. The prices, except for the NEC, are suggested list prices (the street price should be somewhat lower than the listed price). The drives are listed in alphabetical order by manufacturer.



NOTE: *We did not use an extensive lab, or elaborate equipment and procedures to test the CD-ROM drives. We offer only a subjective view of our experience with the drives. Use this just as a guide to, not a review of, a few of the many drives available on the market.*

NEC MultiSpin 38, 74, and 84 Series

NEC Technologies, Inc.
1414 Massachusetts Ave.
Boxborough, MA 01719
(800) NEC-INFO or (800) 632-4636
Estimated street price (we couldn't obtain list prices for the drives):
MultiSpin 38, $465; MultiSpin 74, $515; MultiSpin 84, $615.

NEC was the first to introduce a double-speed CD-ROM drive in 1992. The MultiSpin series (see Figure 11-6) is the latest offering from the pioneer of double-spin technology. Media Vision uses several different NEC drives in their multimedia upgrade kits.

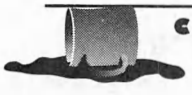
The MultiSpin 38 is the entry-level drive. With an average access time of 400ms and a transfer rate of 300KB/sec, this drive is unique in that it can operate on an optional battery pack. This makes it ideal for portable computer users. It has a 64KB buffer and is Kodak Multisession Photo CD compatible, making it an affordable MPC Level 2-compatible drive.

FIGURE 11-6 *The NEC MultiSpin series CD-ROM drive*



The MultiSpin 74 is the external brother of the internal MultiSpin 84. Both feature an average access time of 280ms and a transfer rate of 300KB/sec. These NEC drives feature an attractive two-year warranty. They also are MPC Level 2 compatible, meaning they feature about everything you'd look for in a CD-ROM drive including CD-ROM XA, Kodak Multisession Photo CD, a 256KB RAM buffer, and SCSI-2 compatibility.

NEC tech support doesn't have a good reputation. The quality of NEC support was spotty, and their technicians were sometimes hard to reach. They do, however, have an excellent automatic fax service that can fax you all kinds of documents regarding the installation of their drives. The nice thing about purchasing an NEC drive is that Media Vision technicians are intimately familiar with it, as Media Vision bundles it with some of their multimedia upgrade kits. Media Vision technicians are easier to reach if you run into installation difficulties.



CAUTION: *There have been some reports that many NEC drives do not read standard CD-ROM discs created with the new Sony and Philips CD-WO drives. If you plan on using discs made on these write-once drives, make sure you test for compatibility before committing to a NEC drive.*

Pioneer DRM-604X

Pioneer Communications of America
3255-1 Scott Blvd., Suite 103
Santa Clara, CA 95054
(800) 527-3766
Suggested list price: $1,845.

Pioneer is the only CD-ROM drive manufacturer who offers a multidisc CD-ROM changer. The DRM-604X (as seen in Figure 11-7) automatically switches from among six CD-ROMs that can be loaded at once. The discs are loaded in a multidisc magazine, similar to those used in Pioneer multidisc CD players for cars and home stereos. The drive is expensive, but it is well worth the asking price, especially if you're a heavy user of CD-ROM titles in a commercial or educational setting.

Once installed, the drive appears as six DOS drive letters—each CD in the 604X is assigned a drive letter. The discs are switched automatically depending on which drive letter you're accessing. Amazingly, it takes a mere five seconds for the drive to swap to the appropriate disc. It can certainly switch discs as fast or faster than you can manually with a regular CD-ROM drive. Disc swapping is not only quick, it is also fairly quiet. The drive does not,

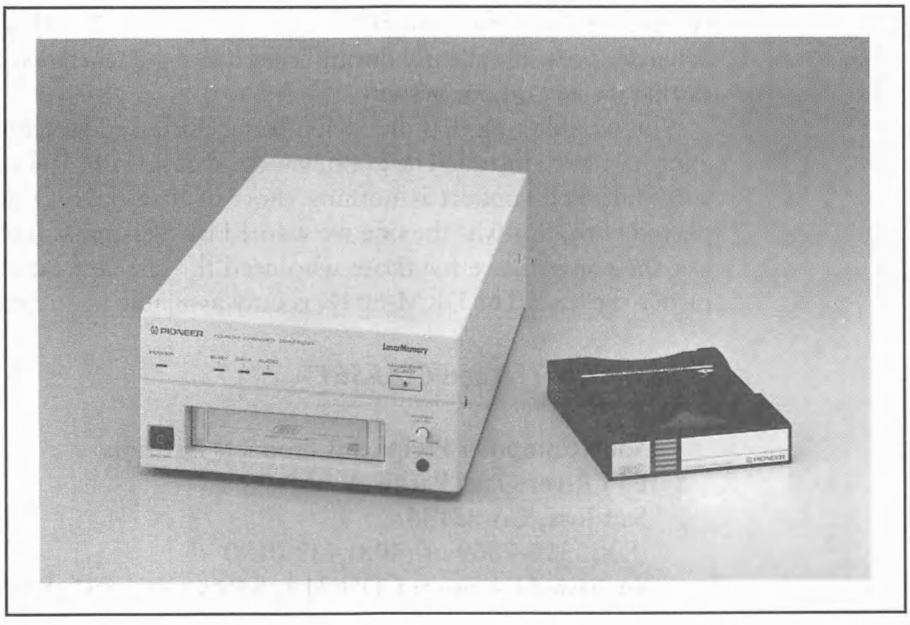


FIGURE 11-7 *The unique, quadruple-speed multidisc Pioneer DRM-604X*

however, automatically search through all six discs for the appropriate one—you have to tell the computer which drive letter you want. You can somewhat simulate an automatic search by including all six drive letters in the PATH statement in your AUTOEXEC.BAT file.

The drawback to the multidisc changer is that you almost always have to load the same disc into the same spot in the changer. Many programs, such as Compton's Encyclopedia, expect to find the appropriate disc as a certain drive letter. For example, if Compton's Encyclopedia was originally installed from drive G:, it expects to always find the Compton's CD-ROM in drive G:. One way to solve this is to buy additional disc magazines whenever you fill one up with the six discs maximum—that way, all your drive letters stay the same because you're not constantly loading and unloading discs from one magazine. For example, you could have a disc magazine that contains only reference-type CD-ROMs, one with just games, and yet another with just Windows applications.

The 604X is currently the only drive that spins the disc at four times normal speed. It boasts a stratostrophic 612KB/sec transfer rate, the highest of any drive in our survey. This speed is really evident when playing back animation from a CD-ROM. Multimedia film clips with simultaneous sound play back very smoothly without even the slightest pause; the busy-light on the drive barely stays lit even when the drive is retrieving video and sound from the CD. Loading a big program like Corel Draw! from the CD was noticeably quicker than with other CD-ROM drives. Seek time is a some-

what more down-to-earth 300ms, but it is no slouch in that area either. The drive does operate silently during seeks and it switched discs without a hitch during its stay on our system.

You would think that the 604X, being cutting edge technology, would be a lot harder to install. The good news is that it isn't. And Pioneer has made sure that tech support is nothing short of first-class. Of all the drives we played with, this was the one we wanted to keep most. It is very expensive, but the convenience for those who need the changer capability may easily justify the cost. The DRM-604X is only available in an external enclosure.

Sony CDU-31A and CDU-561

Sony Computer Peripheral Products Division
655 River Oaks Parkway
San Jose, CA 95134
(800) 352-7669 or (408) 432-0190
Suggested list price: CDU-31A, $499; CDU-561, $649.

Sony is a well known giant in the world of consumer electronics. Sony products are widely available at competitive prices. They are also among the most popular. Their products are renowned for their excellent quality.



NOTE: *A Sony CD-ROM drive is included with the Fusion CD 16 kit. Media Vision made a special version of the Pro AudioSpectrum Plus with a modified SCSI interface that turns the Sony CDU-535, which was part of the Sony Laser Library, into an MPC-compliant drive. The special version may be worth investigating if you've already purchased the Sony kit. Currently, Sony markets an entry-level multimedia upgrade kit that includes a PAS 16, a CDU-31A CD-ROM drive, a pair of speakers, and some CD-ROMs.*

The CDU-31A is Sony's low-end MPC Level 1-compliant drive that is capable of Multisession Photo CD. This is a tray-loading drive that does not require a disc caddy. The CDU-31A is the slowest drive in our survey—it musters a mere 150KB/sec transfer rate, but is also one of the cheapest.

The Sony CDU-561 (Figure 11-8) is an internal double-speed CD-ROM drive that boosts performance to levels similar to other drives such as the NEC CDR-74. With an average access time of 295ms, it can transfer data at 300KB/sec and boasts SCSI-2 compatibility. This is Sony's premier CD-ROM drive that also features a double dust door, similar to the ones on the NECs. Its external sibling—the CDU-7811—became available in Fall, 1993.

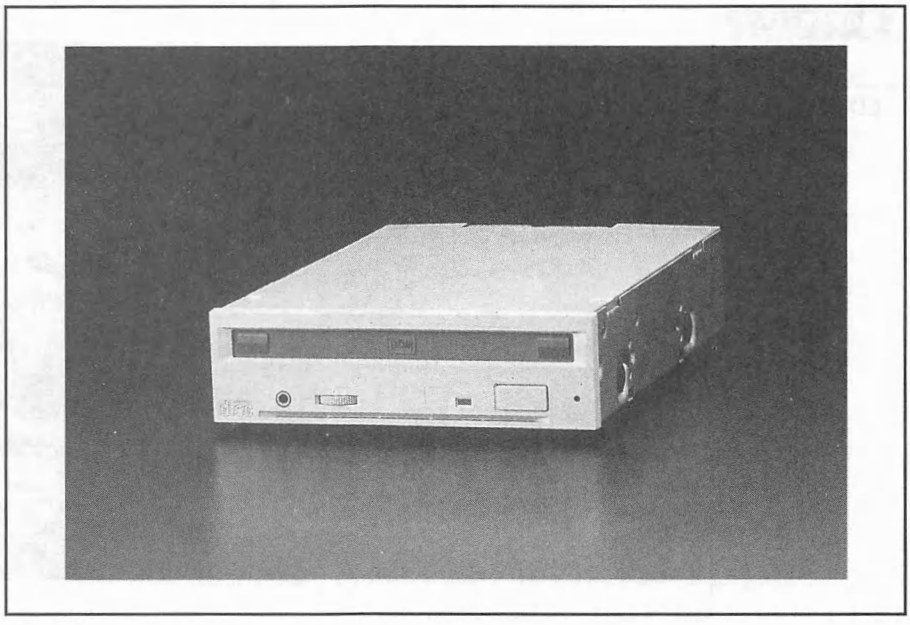


FIGURE 11-8 *The Sony CDU-561 is a capable performer*

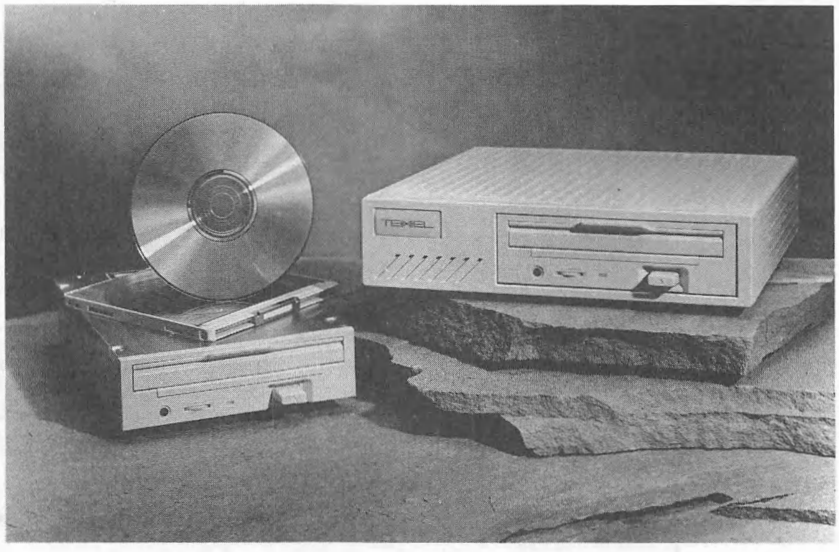
Texel DM-3024 and DM-5024

Texel America Inc.
1605 Wyatt Drive
Santa Clara, CA 95054
(408) 980-1838
(408) 980-1840 Fax
Suggested list price: DM-3024, $499; DM-5024, $599.

For many years, Texel has inconspicuously supplied CD-ROM drives to various manufacturers who resold these drives under their own labels. The Japanese company decided to go after the CD-ROM drive market directly and has established a subsidiary in California to pursue these efforts. They have succeeded in establishing themselves as one of the premier suppliers of quality CD-ROM drives in the same vein as the larger companies such as NEC, Sony, and Toshiba.

The DM-xx24 series (see Figure 11-9), which consists of the internal DM-3024 and external DM-5024, are state of the art, MPC Level 2-compliant offerings. They sport a speedy 265ms access time, second only to the Toshiba, and a transfer rate of 300KB/sec. This is a result of their double-speed capability and also a generous 64KB RAM buffer. The external case is graced with a clean and elegant modern design. Standard features include a dust-resistant door and a self-cleaning laser assembly.

FIGURE 11-9 *The Texel CD-ROM drives are excellent values*



The drive lacks nothing in terms of compatibility, featuring SCSI-2 compliance, Kodak Multisession Photo CD compatibility, and CD-ROM XA compliance. All these capabilities are fully supported by the Pro Audio's CD-ROM driver. This was the quietest drive in the group we tested.

Texel has been known for having excellent technical support, and we were not disappointed. We got quick and patient responses from Texel every time we called them. Texel also sells multimedia upgrade kits that include Media Vision sound cards, so they may be the best value for your money. Overall, Texel drives have the best price/performance ratio of the group we tested.



NOTE: *As we go to press, Texel has introduced a couple of new CD-ROM drives—the DM-3028 and DM-5028 are successors to the DM-3024 and DM-5024, respectively. The new DM-xx28 drives bear an identical exterior appearance to their older cousins, but internal improvements speed up the drive to a faster 240ms average seek time and a 335KB/sec transfer rate. The best news is that the prices for the improved drives remain the same as for the older drives.*

Toshiba XM-3401B and TXM-3401E

Toshiba America Information Systems Inc.
9740 Irvine Blvd
Irvine, CA 92718
(714) 583-3000
Suggested list price: XM-3401B, $695; TXM-3401E, $895.

Currently, the title for the fastest random access seek time belongs solely to the Toshiba XM-3401 series of drives (see Figure 11-10). The record-setting 200ms average seek time performance is achieved by a unique and patent pending mechanism. The increased rotational speed of the drive, exactly 2.2 times normal, also contributes to this achievement. While other manufacturers have doubled the rotational speed and derived a transfer rate of 300KB/sec, Toshiba squeezed in an extra 10 percent in rotational speed, which results in a 10 percent improvement in transfer rate to 330KB/sec. The transfer rate of the XM-3401 is second only to the quad-speed Pioneer DRM-604X.

The XM-3401 is a good choice for multimedia applications. Some programs taxed the slower drives and pushed them to their limits. This was really evident when playing back a sample music video from a CD. On drives with transfer rates of 150KB/sec, the busy-light would stay lit while the five-minute music video ran. The Toshiba's busy-light, on the other hand, only flashed about every half-second to one second.

Other notable features include the sealed, contamination-free enclosure and an automatic lens cleaner. This drive should work well even in dusty environments. The XM-3401B is the internal model, the TXM-3401E is the external version.

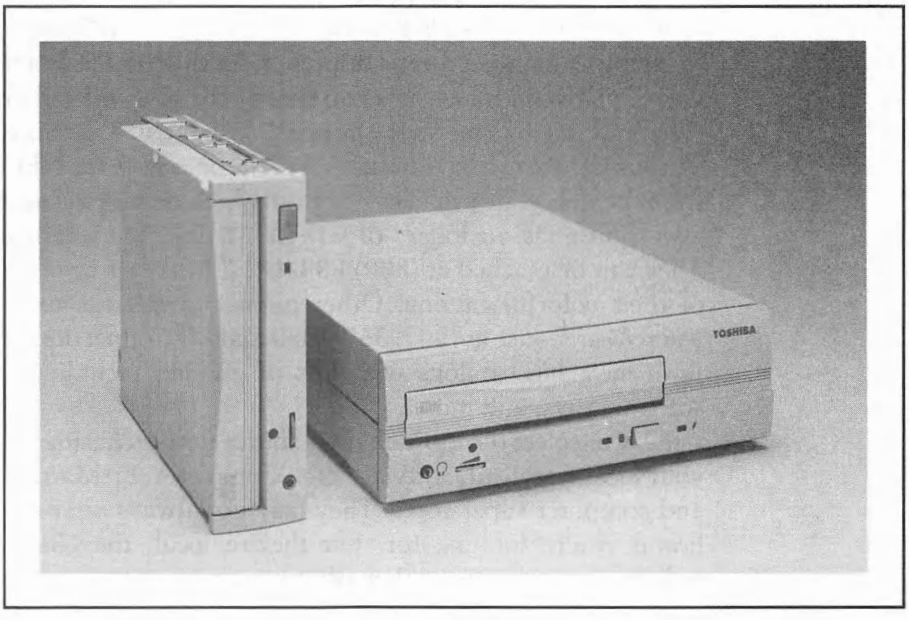


FIGURE 11-10 *The popular Toshiba 3401 series drive*

FINDING THE BARGAINS

All right, so you're all set to purchase the latest and greatest super-duper CD-ROM drive. Here's a brief look at some of the vendors that offer a great variety of CD-ROM drives, multimedia upgrade kits, and CD-ROM accessories.



NOTE: *We have tried our best to provide a list of vendors who we feel are reputable. However, we cannot, and do not specifically endorse any one of them. Use a credit card for your purchases whenever possible. This gives you better recourse should any company fail to deliver on their promises. It may also be useful to check with the Better Business Bureau of the city in which the business operates for any complaints against the company.*

Several mail order companies repackage the Toshiba XM-3401 CD-ROM drive and sell it at a lower price. Relax Technology at (510) 471-6112 markets it as the Vista II; Procomm Technology at (800) 800-8600 as the MCD-DS External and the SiCD-DS Internal drives; and Consan Storage Solutions at (800) 229-3475 as the 3401XT. The drives used in these offerings should be identical to the ones that Toshiba uses in the XM-3401 series. You should not have any compatibility problems if you use the same software drivers as the real McCoy.

The same is true of Texel drives, which are repackaged by other companies. One is the prominent mail order firm Insight Computers at (800) 359-0633. Insight has several different CD-ROM drive OEMs (license to sell other manufacturer's brands under the retailer's name) for their Talon line of drives, so make sure you specify the one with a Texel drive.

A multimedia one-stop shopper's delight is TigerSoftware. They have various CD-ROM drive bundles, but the ones with the NEC MultiSpin drives should catch your eye. They not only include a Pro Audio sound card but also thousands of dollars of CD-ROM titles for seemingly measly prices. They can be reached at (800) 888-4437. Make sure you ask for a free copy of their colorful catalog. Other popular and large mail-order giants are MicroWarehouse at (800) 367-7080 and PC Connection at (800) 800-0003. Both have big catalogs with lots of goodies including CD-ROM drives, software toys, and more.

Don't neglect the most obvious source for purchasing a CD-ROM drive—your local EggHead, Software Etc., CompUSA, BizMart, and other software and computer superstores. They may not always offer the best price or the brand you're looking for, but they're local, they have excellent return policies, and sometimes they offer good service too.



TIP: *One of the best places to purchase CD-ROM titles is your local software store. Remember, the best deals on CD-ROM software are at the time you purchase the drive—you can obtain a drive with loads of bundled CD-ROM titles at a fraction of their actual costs if purchased separately.*

Two places to get CD-ROM software and CD-ROM caddies at great prices (under $5 per caddy) is SofTec Plus at (800) 779-1991 and Walnut Creek CDROM at (800) 786-9907. Interestingly, SofTec not only includes one free caddy for every 10 caddies (or four free for every 25 caddies), but also a free caddy with some titles! That is one feature everyone should get in the habit of offering. When we last checked, both SofTec and Walnut Creek sold Japanese caddies, while Walnut Creek sells U.S. caddies.

Walnut Creek CDROM offers other services, especially helpful if you want to make your own one-copy CD-ROM. They also have valuable and up-to-date collections of shareware software on custom-made but affordable CD-ROMs. Call them for more information. A well-known giant can also produce CD-ROMs for you—IBM Software Manufacturing Company at (800) 926-0364.

There are hundreds, if not thousands, of companies in addition to the ones above, who are starving (hopefully this is not in a literal sense) for your business. Keep in mind that we have a buyer's market and you should arm yourself with the proper information. Be a little skeptical of wild claims or promises; shop wisely, and good luck.

INSTALLING A CD-ROM DRIVE WITH YOUR PRO AUDIO SOUND CARD

The Pro Audio installation guide contains very clear illustrated instructions on installing your new CD-ROM drive. Here are several tips to supplement the manual.

The Hardware

Check with Chapter 2 for some of the tools required for opening up your computer. Chapter 2 also describes some good rules to adhere to when performing what is essentialy open-heart surgery on your PC. First thing to do when you open the CD-ROM drive package is to find the packing list and make sure all the standard items (like cables and a CD caddy) are in the box.



TIP: *Refer to Appendix C for more information about SCSI and how it works in general. That way, you will have a better understanding of what a device select number is, what terminating resistors are, and so on.*

Follow the instructions in your Pro Audio installation guide for step-by-step instructions on installing your CD-ROM drive and the appropriate cable kit. Basically, you need to make three connections using the data cable, power cable, and CD audio cable. The data cable is a 50-to-50-pin ribbon cable for an internal drive, and a 25-to-50-pin cable for an external drive. The power cable is either an internal connector or a regular AC cable for an external drive.



TIP: *Certain Media Vision multimedia upgrade kits include a CD-ROM drive that has a separate installation manual provided by the drive manufacturer. Completely ignore the installation instructions in that manual in favor of the Media Vision installation guide.*

Be careful when attaching the 50-to-50-pin SCSI cable; make sure that the red stripe on the cable corresponds with pin one on the connectors. This means the red stripe is up (at the top) on the Pro Audio SCSI connector. The same applies for the external CD-ROM bracket adapter. If you're hooking up an internal CD-ROM, check the drive for pin 1 orientation and make sure that the red stripe is the side connected to this pin. Most drives have pin 1 next to the power supply connector, but check your drive's manual. Alternatively, look for a triangular mark on the drive's printed circuit board into which the connector is soldered. An inverted connection means that your drive won't work at all. It could also potentially damage the drive or the Pro Audio card.



TIP: *The external data cable that comes with the External CD-ROM Driver/Cable Kit is only three feet long. If you need a longer cable, any Apple Macintosh SCSI 25-to-50-pin cable should work just fine. Longer RCA cables for the audio output can be obtained from any stereo or electronics store.*

The internal audio connection is pretty straightforward, but if you connect the audio cable upside down, you will reverse the left and right channels. The same happens if you make an upside-down connection from the audio connection to the external CD-ROM adapter bracket. If you use an internal audio cable that is not matched to the brand of drive you're installing, you probably won't get any sound at all. With the external CD-ROM drive, you have several options for hooking up the audio cable:

- Use the simple RCA-to-RCA connection from the back of the external drive to the bracket.
- Use the 1/8-inch plug from the headphone output, at the front of the external CD-ROM drive, to the RCA connectors on the bracket.
- Use the RCA connections on the back of the drive and hook it up to the 1/8-inch auxiliary input on the Pro Audio card itself.



TIP: *Correct cables for the appropriate CD-ROM drives can be obtained from Media Vision. The part numbers are listed in the section, "Finding the Right Cables and Connectors" earlier in this chapter.*

If you use either of the first two options to connect the CD audio output to your Pro Audio card, the level is controlled by the mixer's CD input-level setting. With the third option, the CD audio level is controlled by the mixer's auxiliary (AUX) input-level setting.

Lastly, if you've purchased a CD-ROM drive separately, don't forget to check the CD-ROM drive's manual for additional information that may have been left out of the Media Vision installation guide.

The CD-ROM Driver Software

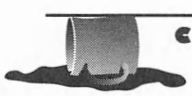
The automatic install on the CD-ROM installation disc copies the appropriate files to a new directory called TSCSI on your boot drive. It also makes the following changes to your CONFIG.SYS and AUTOEXEC.BAT files.

Line added to CONFIG.SYS:

```
DEVICE=C:\TSCSI\TSLCDR.SYS /D:MVCD001 /P3
```

Line added to AUTOEXEC.BAT:

```
C:\TSCSI\MSCDEX /D:MVCD001 /L:E
```



CAUTION: *Both TSLCDR.SYS and MSCDEX.EXE must be loaded into your computer's memory before any program can use the CD-ROM drive. If you receive an Incorrect DOS Version error message when MSCDEX.EXE loads, copy the MSCDEX.EXE file from your DOS home directory to the Media Vision directory.*

Your system needs to be booted, or restarted, before these changes take effect; restart by turning off your computer and turning it back on, or press CTRL-ALT-DEL simultaneously.

This is an additional startup message when TSLCDR.SYS executes in CONFIG.SYS:

```
-------------------------------------------------------------
TSLCD: Trantor CDROM Driver, version 03.23
Copyright (c) 1989-93, Trantor Systems, Ltd.

    --- For The 101 Multimedia Board with SCSI ---
SCSI Host Adapter detected at address 388h.

Device 1, Read-Only Optical Device (Removable media)

1 CD ROM drive found.
-------------------------------------------------------------
```

The additional startup message when MSCDEX.EXE executes (with the /V parameter) in AUTOEXEC.BAT is as follows:

```
MSCDEX Version 2.22
Copyright (C) Microsoft Corp. 1986-1993. All rights reserved.
       Drive E: = Driver MVCD001 unit 0
1616   bytes free memory
0      bytes expanded memory
12978  bytes CODE
2112   bytes static DATA
22948  bytes dynamic DATA
38304  bytes used
```



TIP: *A new CD-ROM drive is treated like a floppy disk drive, except that you cannot save data to a CD-ROM. During the installation, the CD-ROM drive is usually given the next free drive letter after your hard disk. If you have hard disks C: and D:, the CD-ROM is usually assigned the E: drive; if you only have a single hard disk C:, the CD-ROM drive becomes drive D:. You can change the letter assigned to your CD-ROM drive by changing a parameter in AUTOEXEC.BAT. See the "MSCDEX.EXE Parameters" section in this chapter for more detail.*

If you see both startup messages, congratulations—you've completed a successful installation of the CD-ROM drive. If you don't get both messages, turn off the computer and check to make sure that all your connections have been made properly. If that doesn't work, double-check CONFIG.SYS and AUTOEXEC.BAT to ensure that the proper commands have been added by the installation program.

Once you boot up successfully, you can test the CD-ROM drive by requesting a directory listing from any data CD-ROM you have. Assuming your CD-ROM drive is drive D:, insert a CD-ROM in the drive and type **DIR D:** at the C:\ prompt. A directory listing of the CD-ROM should appear on your screen. A CD-ROM drive is a removable storage device like a floppy drive, so if you do not have a CD-ROM in the drive and you try to access it or see a directory, you will get the following message (note that the drive letter may vary on your setup):

```
CDR101: Not ready reading drive e
Abort, Retry, Fail?
```

If this happens, just press A to abort, insert the appropriate CD-ROM, and try again. You'll see the following message if you try to copy a file (in this case, CONFIG.SYS) to the CD-ROM drive:

```
Access denied  - E:CONFIG.SYS
        0 file(s) copied
```

You may encounter other error messages, depending on the application, when trying to add or modify information on a CD-ROM. Remember, you cannot write data to a CD-ROM drive!



TIP: *A good way to check that the CD-ROM hardware, software, and connections have all been installed correctly is to play a regular CD in the CD-ROM drive—you should hear music through the speakers connected to your Pro Audio sound card. You can do this by inserting a regular CD (you do have one of these lying around somewhere, right?) into the CD-ROM drive and using the Musicbox program to play the CD. Refer to your card's Utilities Guide for information on using Musicbox.*

The CD-ROM drivers can consume a lot of conventional (base) memory. You can free up this base memory, thus giving some breathing space to large DOS programs, by loading both TSLCDR.SYS and MSCDEX.EXE into high memory. To load into high memory, you have to use a memory manager like DOS's EMM386.EXE. Your system files may look something like the following.

Sample entries in CONFIG.SYS:

```
DEVICE=C:\EMM386.EXE RAM
DOS=HIGH,UMB
DEVICEHIGH=C:\TSCSI\TSLCDR.SYS /D:MVCD001 /P3
```

Sample entry in AUTOEXEC.BAT:

```
LOADHIGH C:\TSCSI\MSCDEX.EXE /D:MVCD001 /L:E
```

If you do not have enough high memory to load both these drivers, load the biggest one that fits. Note that MSCDEX.EXE version 2.22 (currently the most recent version) is easier to load in high memory than prior versions.



TIP: *If you're using DOS 6, run MEMMAKER after installing your CD-ROM software to automatically optimize your memory configuration. QEMM users can run an equivalent program called OPTIMIZE.*

The automatic installation should suffice most of the time. If you want to tweak or optimize your system, be ready to dust off your CONFIG.SYS and AUTOEXEC.BAT editing skills. In an upcoming section, we describe the different parameters you can use with both TSLCDR.SYS and MSCDEX.EXE to fine-tune your setup.

Mixer Settings

Depending on which connection you made for the audio cable, you may have to use either the CD input or AUX input levels to control the volume of a regular audio CD. Not all music or sounds from a CD is controlled by these settings, though—sounds can actually originate from the FM synthesizer or PCM circuit on the Pro Audio card, which are controlled by other settings instead. Most of the time, CD-ROM software programs use digitized audio and MIDI data files to generate sound on the Pro Audio sound card.

There is much confusion, especially with CD-ROM games, as to which audio source is being used, and therefore which levels need to be adjusted in the mixer. Very few games use regular audio CD for the accompanying music or sound effects; most use sounds generated from the Pro Audio FM synthesizer or PCM circuit. A few notable exceptions for games that use audio CD extensively for music or speech are LucasArt's CD-ROM versions of Loom and Monkey Island, and Infocom's Return to Zork on CD ROM.

One way to check if a game (or any program) is using audio CD for its music or sounds is to plug a set of headphones into the 1/8-inch headphone sockets at the front of most CD-ROM drives. If the sound is heard through the headphones, then the program is using audio CD. If the sound is only coming from the speakers connected to your Pro Audio sound card, then the sound is generated by the FM synthesizer or PCM circuitry on the Pro Audio card. After determining the source, you can adjust your mixer settings appropriately.



NOTE: *If you're getting distorted sound from your music CD with a Pro AudioStudio 16, try adding G:0 to the MVSOUND.SYS file, or try using the $15 buffered audio cable available from TTS at (800) 887-4968.*

Refer to Chapter 3 and Chapter 4 for more detailed explanations of the mixer settings and the various file/sound formats.

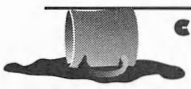
TSLCDR.SYS Parameters

TSLCDR.SYS is a driver that is loaded in CONFIG.SYS. It translates instructions provided by MSCDEX.EXE, and passes it on to the Pro Audio SCSI chip for processing. The current version of TSLCDR.SYS is 3.02 and it occupies 13,024 bytes of memory. The entry in the CONFIG.SYS file looks like this:

DEVICE=[*path*]\TSLCDR.SYS /D:[*device name*] [/P*n* /R /U*n* /W*n*]

The parameters are as follows:

[*path*]	Specifies the DOS path to the driver. Example: C:\TSCSI.
[*device name*]	Specifies the name of the device, which should be identical to the entry for MSCDEX.EXE. Example: MVCD001, CDROM01, or NECCDR74.
/P*n*	The number *n* can be 0 to 3: 0 Seek and Prefetch are disabled (default) 1 Allows Prefetch 2 Allows Seek 3 Allows both Seek and Prefetch
/R	Resets the CD-ROM drive before the driver loads.
/U*n*	Restricts the maximum number of logical units (LUNs) available. Useful when a device, such as the Pioneer CD-ROM changer, has multiple logical units that are not being used. This allows you to select, for instance, only the first three LUNs and ignore the others. The *n* can be any number between 1 and 7.
/W*n*	Pause (warning) mode. The number *n* can be: 0 Pause for a key to be pressed if no CD-ROM drive is detected (default) 2 Pause for a key to be pressed if a CD-ROM drive is detected 3 Do not pause at all



CAUTION: *The [device name] specified for TSLCDR.SYS cannot be the same as any file or directory on your hard disk.*

For example, the following entry installs the CD-ROM driver with the name MVCD001, enables Seek and Prefetch, and provides instructions not to pause regardless of error.

```
DEVICE=C:\TSCSI\TSLCDR.SYS /D:MVCD001 /P3 /W3
```

MSCDEX.EXE Parameters

MSCDEX.EXE acts like a translator for all software that wants to access the CD-ROM drive. It receives instructions from various programs, deciphers them, and then passes the request to TSLCDR.SYS for processing. This driver is run in AUTOEXEC.BAT. The current version of MSCDEX.EXE is 2.22 and it occupies 35,570 bytes of memory by default. The entry in the AUTOEXEC.BAT is as follows:

[*path*]\MSCDEX /D:[*device name*] [/L:[*drive letter*] /V /M[*n*] /E /K]

The parameters are as follows:

[*path*]	Specifies the DOS path to the driver.
[*device name*]	Specifies the name of the device, which should be identical to the entry for TSLCDR.SYS. Example: MVCD001, CDROM01, or NECCDR74.
/L:[*drive letter*]	Specifies the drive letter to be assigned to the CD-ROM drive. Example: /L:E. If this parameter is omitted, MSCDEX.EXE assigns the next available drive letter. If more than one CD-ROM drive is attached, the drive letters are sequentially assigned starting with [*drive letter*].
/V	Provides a verbose (detailed) listing of MSCDEX.EXE memory usage. This is useful to determine exactly how much memory MSCDEX.EXE uses.
/M:[*n*]	Specifies the number of buffers to use for caching CD-ROM information. By default, MSCDEX uses 10 buffers. Each buffer requires an additional 2,048 bytes in memory. 10 to about 20 are ideal. Reduce this amount to between 3 and 8 when using a CD-ROM software cache program.
/E	Tells MSCDEX.EXE to load all its data buffers up into EMS (Expanded Memory Specification) memory. If you are using a memory manager, this saves you about 16KB of main memory.
/K	Used only when the CD-ROM directory is written in Kanji (Japanese).

For example, the following entry installs MSCDEX as the drive with the name MVCD001, assigns drive letter E: to the CD-ROM drive, assigns 20 buffers to cache data, loads the buffers into EMS, and displays a verbose listing of memory being consumed by MSCDEX.

```
MSCDEX /D:MVCD001 /L:E /M:20 /E /V
```

IMPROVING PERFORMANCE WITH A SOFTWARE CACHE

One of the ways to speed up any storage device, such as a CD-ROM drive, is to hold some of the data in a temporary holding place in main memory using a software cache. Access to main memory is almost instantaneous, so a computer can read data from a cache faster than from the hard disk or CD-ROM. Of course, this is only true if the data the computer is looking for is already residing in the cache. When data is read, a copy is placed in this cache. The data in this cache is temporary and is replaced by the most recently accessed data—as the cache fills up, data in the cache changes in FIFO (first in, first out) order. Examples of some popular hard disk software caches that you may be familiar with include: Microsoft's SmartDrive, included with DOS 5, DOS 6, and Windows 3.1; Norton's NCache; PC-Kwik's Super PC-Kwik; Hyperware's Hyperdisk; and Future Systems's Speed Cache+.

Not all software caches can handle the special requirements for caching CD-ROMs. SmartDrive is an example of a hard disk software cache that does not cache CD-ROMs. If you also want to cache a CD-ROM drive, you have to purchase a separate cache program.



NOTE: *A software cache should not be confused with a hardware cache, such as the RAM buffer built into most CD-ROM drives. The RAM buffer—even at 256KB—is too small to cache any data file or program. Also confusing is the CPU cache, often quoted as part of the computer's specifications in sales literature and advertisements. For example, a computer ad may read "Intel 486DX/50 with 8KB internal cache and 64KB cache". The 8KB and 64KB caches are both dedicated to the CPU (central processing unit) and are used for caching CPU instructions—they are not used for caching data from a hard disk, CD-ROM, or any other storage device.*

Caching CD-ROM

A handful of companies have designed programs that specifically cache a CD-ROM drive. The most visible is probably CD Speedway from Bloc Publishing. Another recently introduced CD-ROM cache is Lightning CD from Lucid Corporation. Caching a CD-ROM is a completely different process than a hard drive. CD Speedway only allows caching CD-ROM data

to the hard disk (instead of RAM), while Lightning CD can cache to either RAM or a hard disk.

CD Speedway only caches data from CD-ROMs, so you still must use a cache like SmartDrive for your hard disks. Lightning CD, on the other hand, caches hard drives as well as CD-ROMs. Either program eats up significant amounts of your memory, which may prevent some DOS programs from running. Unless you set up a fairly large cache or access the same information over and over again at a time, the drawbacks of both products overwhelm their advantages. Multimedia titles, because of their inherently large data files, do not benefit greatly from these products.

The most successful program we encountered for caching CD-ROM drives was Norton's SpeedCache Plus. Its caching technique is different than CD Speedway or Lightning CD. Being a multi-purpose cache, SpeedCache also caches hard disks and floppy disks. The program uses a reasonable amount of memory considering its functionality, and it is much smaller than CD Speedway or Lightning CD (it's about half the size of Lightning CD).

Unless you can afford to sacrifice some memory, you have a lot of free hard disk space, or you access many reference-type CD-ROMs frequently, the $80 or so you'd spend on a CD-ROM software cache program is better spent towards a faster CD-ROM drive. If you already have a CD-ROM drive and are looking to improve performance, Norton's SpeedCache Plus is the best of the lot.

You can obtain more information from the following companies:

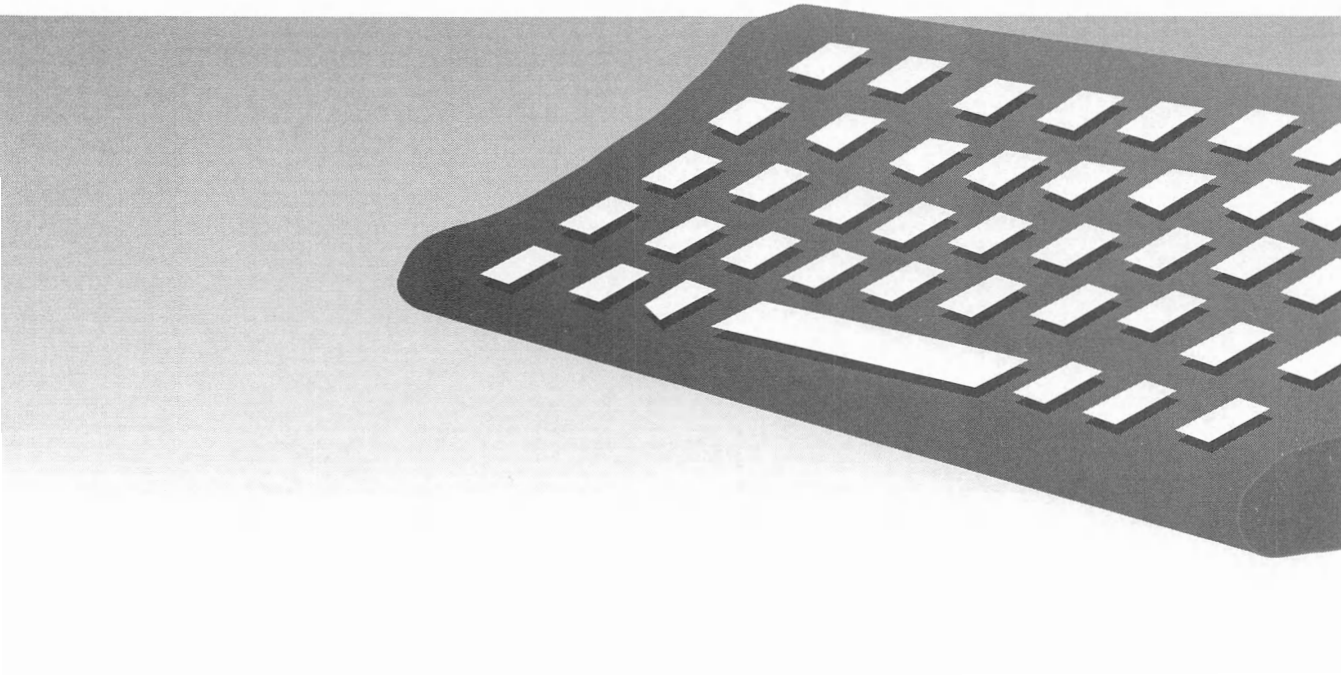
Bloc Publishing (CD Speedway, List: $72.99)
800 SW 37th Avenue, Suite 765
Coral Gables, FL 33134
(800) 888-2562

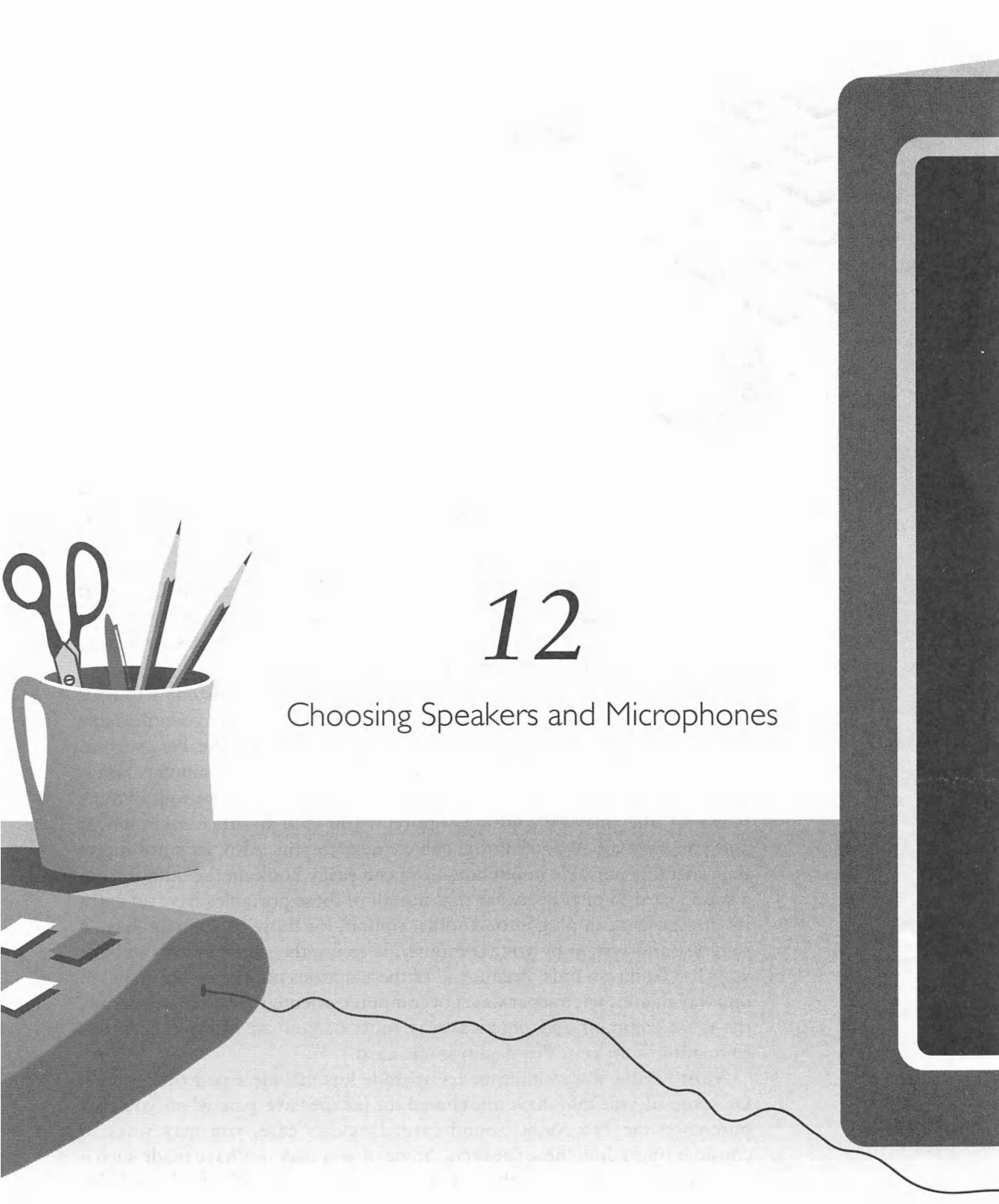
Lucid Corporation (Lightning CD, List: $99.99)
101 W. Renner Road, Suite 450
Richardson, TX 75082
(214) 994-8100

Symantec Corp. (Norton's SpeedCache Plus, List: $89.99)
10201 Torre Avenue
Cupertino, CA 95014
(408) 253-9600

Stop the Presses!

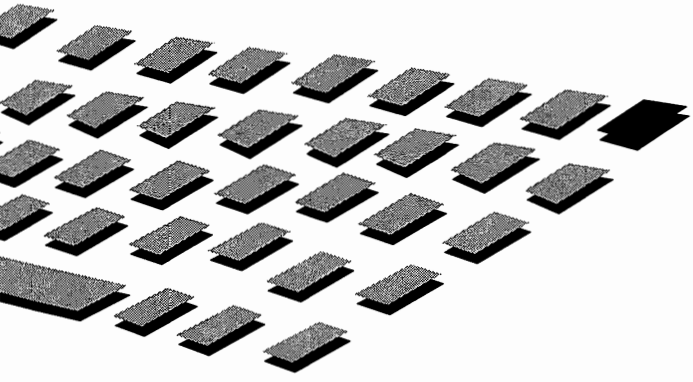
Just as we thought we had completed this book, NEC introduced the next salvo in the CD-ROM drive races—the NEC MultiSpin 3X and 4X series drives. The 3Xe external ($600) and 3Xi internal ($500) CD-ROM drives boast triple-speed motors which translate to access times of 195ms and transfer rates of 450KB/sec. The portable 3Xp ($455) will run on an optional battery pack, and it shares the same transfer speed, albeit with a slower—but still respectable—access time of 250ms. The 4X Pro ($995) is targeted for professionals requiring quadruple-speed CD-ROM drives; it boasts a transfer rate of 600KB/sec, the fastest of the lot. Check with Media Vision for support of these drives in their Pro Audio CD-ROM drivers.

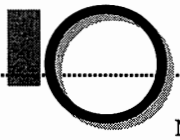




12

Choosing Speakers and Microphones





NE of the most important items you'll probably purchase to accompany your new Pro Audio sound card is a pair of speakers. We've spent a great deal of time talking about some of the best software available for producing outstanding music and sound effects. In the end, you'll most likely hear these sounds reproduced through a pair of speakers. Also, you may consider adding a CD-ROM to your system in the near future. When you do, you'll have another high-quality music source (regular CDs) that you can play through your computer's speakers. Thus, the quality of your speakers is important if you want to be able to hear the best sound from your Pro Audio sound card or music CDs.

A pair of headphones is technically all that you need for listening to your sound card. You can use the headphones that came with your portable Walkman or personal stereo, but this is obviously not the best way to experience the excitement of having a sound card in your computer. Headphones can also become uncomfortable when worn for long periods of time. However, they may be your only option if you're in an office environment and you have a coworker in the cubicle next to you. Also, let's not forget the venerable portable boom box—you can easily hook up the output from a sound card to one. Be aware that not all of these portables have an extra input that you can plug into. Another option, for those of you who have a stereo sound system by your computer, is to use the stereo system to blast your Pro Audio sounds. Because all of these options may be inconvenient in one way or another, a separate set of computer-oriented speakers is generally the most common and practical way most of you can enjoy the sounds emanating from your Pro Audio sound card.

Most Media Vision multimedia upgrade kits include a pair of speakers. Or some of you may have purchased an inexpensive pair when you first purchased the Pro Audio sound card. In either case, you may want to consider upgrading these speakers. Some of you may not have made such a purchase, in which case this chapter can arm you with the knowledge required to make a good first selection.

We start by spending some time exploring the important things to look for when purchasing a pair of speakers. This first section gives you some idea of how to interpret the jargon used by speaker manufacturers to describe their products. Then we survey a number of speaker systems specifically designed for use with your sound card. You can find many of these speakers in your local software, computer, or electronics store. But just in case, we've included a few mail order companies as well as manufacturers who you can contact. After you purchase your speakers, check out the section called "Getting the Most from Your New Speakers—Setup and Positioning" for some good advice. Finally, we take a quick look at microphones.

CHOOSING THE RIGHT SPEAKERS

Selecting a quality pair of speakers is perhaps the most overlooked aspect of purchasing and using a sound card. (The audio industry in general is one fraught with hype and misunderstandings.) Speakers affect the sound of any audio system quite dramatically, but selecting speakers for your computer sound system is a little different than selecting one for your home stereo.

Powered Versus Unpowered

The speakers you're most familiar with—the ones that are included in boom boxes, home stereos, and televisions—are frequently of the unpowered variety. *Unpowered speakers* require a separate amplifier to produce enough current to generate sounds. The amplifiers are either a separate component or are built into the electronics of the components themselves, such as the TV.

The Pro Audio cards have a built-in amplifier. Therefore, you can easily connect any unpowered speakers directly to the Pro Audio sound card. However, the built-in amplifier is not a very powerful one. The volume you obtain from any speakers hooked up this way is dependent on the impedance of the speakers. *Impedance* describes the degree to which the speakers impede or resist the flow of electricity from the amp, and it is measured in ohms. An 8-ohm speaker impedes twice as much as a 4-ohm speaker. The power rating of the Pro Audio sound cards is 4 watts into 4-ohm speakers, which means the sound card can only manage 2 watts into 8-ohm speakers. This specification can usually be found on a label on the back of some speakers.

Most regular-sized home stereo speakers are of the 8-ohm variety. The ones that are found on smaller portable or car systems usually have an impedance of 4 ohms. You can attach the common 8-ohm speakers to the

Pro Audio, but the volume you obtain from them is quite weak. The amplifier built into the Pro Audio is ideally suited for 4-ohm speakers. If you happen to have a pair of extra speakers around somewhere, it doesn't hurt to try attaching it to your Pro Audio card to see whether you get adequate sound volume and quality from them.

The more practical method is to purchase a pair of powered speakers. *Powered speakers* differ from their unpowered cousins in that the amplifier is actually built into the speaker enclosure itself. Because the amplifier is built-in, all powered speakers require a power source. Some may use batteries; others come with an AC adapter that you can plug into an AC outlet; and a third variety gives you the option of using either batteries or an AC adapter.

All speakers designed for use with your sound card, as well as all those we surveyed later in this chapter, are of the powered variety. With powered speakers, you do not have to worry about matching up the impedance (and other technical specifications) of the speakers and the Pro Audio card—all powered speakers work properly with it.



NOTE: *Powered speakers are also commonly known as self-amplified speakers or active speakers. There may be other names that are used for this type of speaker, but the distinction is that powered speakers contain a built-in amplifier within the speaker enclosure. For the rest of this chapter, we will use the terms* speakers *and* powered speakers *interchangeably.*

Sound Quality

One of the most important criteria for any speaker purchase, especially if you're going to buy the more expensive speakers, is the sound quality. Judging sound quality is a subjective art, so we refrain from trying to provide a concrete method to measure the sound quality of any speaker. Speakers initially judged as good may be relegated to merely acceptable after you get a chance to listen to comparatively superior speakers. You might place the importance of certain aspects of the sound above others; for example, you may want speakers with great bass, while someone else may prefer speakers that reproduce voices clearly.

The important lesson is to listen to a variety of speakers within your budget before making a decision. If this is not possible, make sure the store from which you purchase the speakers has a good return or exchange policy. Take advantage of such policies. After all, you have to listen to all your Pro Audio sounds through those speakers—find a pair that you can live with.

Having just said that the sound quality of a pair of speakers can be entirely one of personal preference, we now will try to sort out some of the

measurements used by speaker manufacturers to describe their products. These specifications cannot tell you exactly how any pair of speakers will sound, but they can at least help steer you in the right direction.

Fallacies of Specifications

Manufacturer specifications for speakers can be very deceiving. Manufacturers often use different standards or methods for obtaining their measurements. The interaction of sound, the placement of the speakers, and the type of room and its contents are all complex issues and are impossible to predict precisely. Moreover, even two speakers that measure the same may not sound the same. Listening to two speakers measured identically under laboratory conditions, our perception of how they sound in comparison to each other may be as far from your opinion as the North and South Poles. Hearing and perception are not exact sciences.

Remember, the most important judge of sound quality is you; use and trust your ears. You should not purchase any speakers based entirely on the manufacturer's specifications. After all, you couldn't accurately establish whether the food tastes good simply from the list of its ingredients.

Frequency Response—The Highs and Lows

Frequency is the measurement used to describe the range of sounds that are perceived as high or low in pitch. For instance, a triangle or cymbal is high in pitch, whereas a bass guitar or a bass drum is low in pitch. Sound waves are actually vibrations in the air that our ears pick up and send as signals to the brain. The brain translates these signals into what we know as sound. The *pitch* of a sound is dependent on the number of times the sound vibrates in a second, or the speed of the vibration. This speed is measured in units called hertz (Hz). A sound that vibrates once per second is considered to be a note measuring 1Hz. The average human can hear sounds in the range between 20Hz and 20,000Hz (or 20KHz). The lower numbers, such as 20Hz, represent the bass; the higher numbers, such as 20KHz, represent the treble. You may also hear the term *midrange,* which refers to the frequencies in the 300Hz to 5,000Hz area.

The *frequency response* of a speaker is an indication of the range of notes it is capable of reproducing. Generally, the wider this range, the better. Speakers with a frequency response of 60Hz to 12KHz should theoretically produce lower bass and higher treble than those capable of 100Hz to 9KHz. If you want to have good bass, look at speakers with a frequency response that goes below 150Hz. Keep in mind that the actual frequency response of

any speaker can vary depending on a multitude of factors. What is measured in the lab may not necessarily be what you can achieve in your room.

The caveat is that many manufacturers use different methods to derive their frequency response specifications. This pretty much invalidates any direct comparison between speakers of various makes based on this specification alone.

In a typical home stereo setup, the listener may sit anywhere from a few feet to dozens of feet away from the speakers. By the time the sound gets to the listener, it is usually mixed in with sounds that have reflected from the floor, ceiling, walls, and other objects in the room. The frequency response of the speakers can be greatly affected by, and is dependent on, the room and its furnishings and the position of the listener. Because you are likely to sit in one spot when using your computer, and your computer speakers will probably be on a desktop about two to four feet away, chances are that the sound and frequency response of computer speakers are less affected by the room. This is good news, because it makes setting up computer speakers a lot less complicated.

Power Output—Watt Does It Really Mean?

Another of the quoted specifications for speakers is its power output capability. Measured in watts (or watts-per-channel, as the case may be), *power output* reflects the ability of the speakers to absorb a certain amount of electricity from the amplifier without damage. The higher the number of watts, the greater the ability of the speakers to withstand a higher electric current from the amp. In the case of powered speakers, the power capability of the speakers reflects both the power output of the built-in amplifier and that of the speaker itself. It is erroneously believed that the power output directly corresponds to the loudness or volume of the speaker; on the contrary, this measurement by itself does not indicate the loudness of the speaker.

Speakers translate electrical signals from the amplifier into an ever-changing magnetic field that moves a speaker cone. The vibration of the cone produces the sound waves that we perceive as sound. The efficiency of this process, the translation of the electrical signal to movement of the cone, affects the loudness of the speakers directly. This, combined with the power output specification, is a more accurate indication of the loudness of any speaker system. Unfortunately, the efficiency of the speakers (usually referred to as *sensitivity*) is one measurement that is commonly specified for home audio speakers but is not commonly used by computer speaker manufacturers.

Loudness, or the volume of sound, is measured in decibels (dB). At best, it takes about a 3dB change in loudness before we can positively perceive a

difference in the volume level. All things being equal, it takes twice the power to increase the loudness by 3dB. Thus, you will be hard-pressed to hear the difference between speakers capable of 18 watts and speakers capable of 24 watts. However, you should definitely note a difference in loudness between one with 8 watts of output and one with 20 watts of output.

Distortion Levels

Distortion level, measured as a percentage of the power output level, also plays a crucial role in determining sound quality. Distortion is anything that alters the music signal. Distortion can be minimized, but never eliminated. Total Harmonic Distortion (THD) is a popular measurement for certain distortions created by speakers. The only thing you need to keep in mind is that the lower this percentage is, the better. For example, speakers capable of 20 watts with a .5 percent THD should, theoretically, sound better than those of similar wattage but with a 10 percent THD. However, since new kinds of distortion are discovered frequently, THD is somewhat inadequate in providing an accurate idea of what a speaker will sound like.

We can't emphasize enough that all the measurements in the world cannot tell you how the music will sound through any particular speakers. You owe it to yourself to listen to the speakers before making a purchase.

Bells and Whistles

You should consider other factors besides sound quality when purchasing speakers for your Pro Audio sound card. Some of the bells and whistles can actually add to the value of the speakers; others you can't or may not want to live without. Some of the popular enhancements are tackled here.

Sound Enhancement Circuits

Speakers designed for computer use must overcome several obstacles not faced by traditional speakers. One of these obstacles is the fact that computer speakers are usually placed fairly close together, due to the confinements of the desktop and the user's listening position. Most speakers used in a home stereo are typically placed anywhere from 6 to 20 feet apart. You separate the speakers because you want to achieve a good *stereo effect*—or what is known technically as *imaging, sound stage,* and *sound field.* This is somewhat difficult to achieve, given the *near-field* listening environment of a computer user, where the speakers are typically only one foot to three feet apart. That's where the various sound enhancement circuits come into play.

These circuits go by a variety of names, depending on their manufacturer; examples of trademarked names are Persona's Sonic Imaging and Altec Lansing's Digital Signal Processing (DSP). They are all circuits in the speakers designed to recreate a wide and realistic sound field from the small confines of your desktop. You should note that the Pro Audio sound card itself contains a sound enhancement circuit similar to the ones described here.



TIP: *You can toggle the Pro Audio sound enhancement circuit on and off by selecting Treble Enhance in either the DOS or the Windows mixer.*

Some of these enhancement circuits work better than others. Both Altec Lansing's DSP and the one built into the Pro Audio sound cards introduce quite a noticeable amount of hiss. Whether the effect of the circuits on the sound itself is an enhancement is arguable—the circuits seem to lend themselves better to sound effects than to music. Of the speakers we surveyed with such a circuit, we prefer Persona's Sonic Imaging circuit because it's the least destructive to music and it maintains good results with sound effects for the various games we tried with it. Additional hiss introduced by Sonic Imaging is either negligible or nonexistent, certainly not as evident as that of the other two circuits. Combining the effects (in other words, turning on the Pro Audio circuit and the circuit on the speakers) serves only to muck up the sound even further—all at once, the sound becomes riddled with strong echoes, and speech becomes almost incomprehensible most of the time.

Is a sound enhancement circuit a desirable feature? The answer to that question not only depends on your taste but also on your budget. You won't find this extra item in speakers with anything less than a $150 list price. The circuits do seem to work, albeit better on some material than others. For example, these circuits clearly help sound effects to sound a little bit more convincing, but we feel they generally have a deteriorating effect on vocals. Furthermore, since the Pro Audio sound cards themselves contain a similar circuit, it may not be crucial for the speakers to have a sound enhancement circuit after all.

Volume, Balance, Tone, and Other Controls

Some speakers feature controls other than the almost obligatory volume knob, including separate controls for volume on each speaker, balance control, tone or separate bass and treble controls, bass boost buttons, and so on. It seems redundant to have some of these controls on your speakers, because the Pro Audio sound cards have a built-in mixer that already features a variety of these controls. Specifically, the Pro Audio card allows for

separate right and left volume control, a bass and treble control, a bass enhance (sometimes called "loudness" in home stereos) and a treble enhance. However, if you're going to have such controls on the speakers, it is more convenient to have just one volume control and balance control rather than having separate volume controls on each speaker. A power on/off button is also useful, because it allows you to easily turn the speakers off when you're not using them.

Keep in mind that Pro Audio software also allows for hot key combinations to control the output volume in both DOS and Windows (refer to Chapter 3 for more information regarding the mixers). There are situations when volume control on the speakers is useful—such as when the phone rings and you need to turn down the volume, but the software you're running has disabled the hotkeys. The bottom line is that controls other than volume and power on the speakers are less important in light of the enhanced abilities of the Pro Audio sound cards.

Multiple Inputs and Outputs

Having a multiple number of inputs on the speakers may be very important if you plan to attach devices other than your Pro Audio sound card. For example, you may have a MIDI keyboard that you want to play without turning on your computer, or you have a Walkman you want to play tunes on.

A headphones output on the speakers can also be useful. That way, you won't have to reach for the back of your computer if you frequently switch from using speakers to headphones. You simply plug the headphones into the speakers whenever you want to use them—the speakers are usually automatically muted when the headphones are connected in this manner.

Other Important Features to Consider

The features in this section are important and should be looked for. Magnetic shielding and an additional power supply—features not usually found on regular stereo speakers—are imperative for powered speakers used with your computer.

Magnetic Shielding

Magnetic shielding allows speakers to be placed next to your monitor without adversely affecting your monitor. All speakers have magnets in them that can cause all sorts of distortions on your magnetically sensitive monitor.

Magnetic shielding also prevents damage to data on floppy disks placed in the vicinity of the speakers. CD-ROMs are impervious to magnetism, but floppy disks store information magnetically, which puts them at great risk around magnetic fields.



TIP: *To be on the safe side, you may not want to put floppy disks on top of or beside any speaker, regardless of its magnetic shielding.*

Nearly all the speakers discussed later in this chapter are magnetically shielded. However, depending on the sensitivity of your monitor, some of the surveyed speakers will still cause noticeable flicker when placed too close to the monitor. If you plan to have the speakers mounted on the sides of your monitor or have them butted right up to the sides of the monitors, you want to make sure that whichever speakers you buy will not interfere with the image on the screen.

Power Source and Cables

Most powered speakers require either electricity or batteries to operate. Some of the less expensive speakers do not include the required AC adapter in the package. When you purchase the speakers, check to make sure that an AC adapter is included. Sometimes, if the speakers don't have an AC or DC power input, you have to purchase and use batteries instead. Midrange speakers usually give you the option of using either batteries or an AC/DC power supply. The more expensive speakers include an appropriate adapter. If one isn't included with the speakers, you can usually purchase one from a nearby Radio Shack. Electronic stores, computer stores, and software stores also stock the required adapters. If you are not sure which adapter is required, check with the speaker manual.

You also need the correct cables to connect the speakers and the sound card. Fortunately, almost all speakers include the right cables for this connection. If you find that the cable is missing, you should know that the connection on the Pro Audio sound card is a 1/8-inch mini stereo jack, similar to the headphone jack found on a Walkman. The speakers use a variety of jacks, so you'll have to find a cable that goes from a 1/8-inch mini stereo jack to whatever the connection is on your speakers. But don't worry, these cables are fairly common items at most electronic stores.

Aesthetics

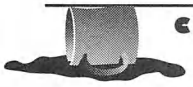
The size and look of the speakers are also important, especially if you have limited space around your computer. Some speakers require numerous cables to connect the left and right speakers in addition to the ones for the power supply and the sound card. Needless to say, exposed cables in dull colors do not contribute positively to a clean, uncluttered work area. Some speakers also have larger enclosures than others and may not fit on a crowded desktop.

Fortunately, some manufacturers thought about these very same issues when designing their speakers. A variety of mounting brackets, arms, and clamps are available. Some companies such as Altec Lansing have thoughtfully included wall mounting kits for their more expensive speakers, eliminating the need to special order these accessories. Some speakers are light enough to be simply attached to the side of the monitor (and off your desk) with strips of Velcro.

You can find some models such as the Media Vision CDPC, with right and left speakers incorporated into one enclosure that conveniently fits underneath your monitor, eliminating cable clutter and facilitating setup. With these all-in-one speaker enclosures, however, you sacrifice the ability to individually place the speakers to achieve an optimum stereo effect.

Power-Saving Circuits

Some speakers incorporate a power-saving circuit. The idea behind this feature is to conserve power, especially when running speakers on batteries. Power saving is accomplished by automatically turning the speaker amplifiers off if no audio signal is received within a short period (usually about a minute). The amplifier is then turned on again as soon as the sound resumes. Though this may conserve electricity and extend battery life, the beginning of some sound clips may be cut off as a result of the amplifier not turning on quickly enough. Though this loss is usually small and is acceptable for use with personal stereos, it can be disruptive for computer applications.



CAUTION: *Like everything else, some power-saving circuits work better than others. This type of circuit cannot be disabled in the majority of speakers that support it, so be careful when you purchase any speakers with such a circuit: Make sure you can return them if the circuit disrupts your computer sessions.*

Many computer games contain large periods of silence intertwined with sections of speech, sound effects, and/or music. During the course of the game, a power-saving circuit may turn the speakers off for lack of any sound, which can prove to be completely disruptive. For example, let's say you're

playing an adventure game, and you've finally found the person who knows a secret phrase. Because it took a while to find this character, the speakers have automatically turned off. The person says the secret phrase as soon as you approach, but the speakers don't turn on in time to catch what was said, or catch only the tail end of the sentence. You can imagine the frustration.

A SAMPLING OF SPEAKERS

The choices in powered speakers for computer use is lacking neither in numbers nor diversity. We gathered a gamut of these to play with and to listen to, hoping to provide a good guide and a head start for those of you considering a speaker purchase.

The prices listed in this survey are based on the manufacturer's suggested retail price. You can often purchase these very same speakers at discounts ranging from 20 to 40 percent off the price listed in this book. Refer to the "Sources and Places to Purchase Speakers" section later in this chapter for the addresses and phone numbers of all the manufacturers included in our roundup of speakers. They should be able to steer you to a dealer or mail order supplier. We also name a few mail order houses later in this chapter.



TIP: *You may not want to spend a lot of money on speakers at first. Plan to upgrade your economical speakers as soon as you're able. To get the best performance from your Pro Audio sound card, we recommend speakers in the manufacturer's list price range of $150 and up.*

The mini reviews and comments about the sound of the speakers themselves reflect our listening bias. You may have a different set of ideals when listening to these speakers. Don't purchase speakers based entirely on our opinions of them—your opinion is the most important one. Use this survey as just a tool to get you started looking for the right speakers. Audition the speakers for yourself; it's OK to disagree with our opinions. Remember the old saying, "One man's meat is another man's poison."

Small Budgets (under $50)

For those of you with a smaller budget, Koss and Labtec are the names to remember. Labtec has the widest range of speakers for those who have a low-to-medium budget. Koss, on the other hand, is a company long known for their headphones. Both brands are widely distributed and can be found in almost any local computer or software store. Radio Shack is another

company with many offerings in this range. Their speakers, however, are designed mainly for use with a Walkman or personal stereo and do not have magnetic shielding, which rules them out for most users.

Keep in mind that their price limits the ability of these speakers to feature any fancy frills or fantastic sound. The speakers in this price range are adequate for most speech, but otherwise, the sound is nothing to write home about. We didn't have a strong preference in this category.



TIP: *None of the prices for the speaker listed in this section take the requisite batteries or AC adapter into account. Budget another $10 to $20 for an AC adapter if you don't want to continually buy batteries.*

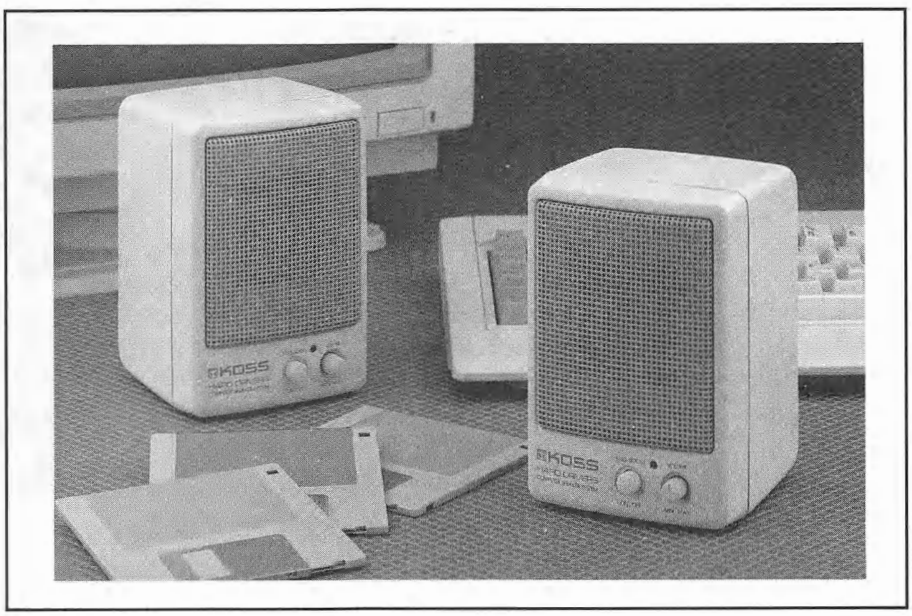
Koss HD/1 ($39.99)

The sound and features of the HD/1 (Figure 12-1) are reflected in the price—which amounts to very little. They are adequate for speech. As to be expected, music played through these speakers sounds like a cheap clock radio.

Labtec CS-150 ($39.95), CS-180 ($49.95)

Both Labtec speakers are spartan on features and sound quality. They are OK for speech, but music (like the other speakers in this range) sounds rather chintzy.

FIGURE 12-1 *The Koss HD/1 basic speakers are good enough for speech*



Medium Budgets ($50 to $150)

Speakers that cost between $50 and $150 provide better sound overall. You will still be hard pressed to please or impress any bass aficionado, though these speakers do have a noticeably wider range than speakers under $50. You have a wide variety of speakers to choose from in this category. Our favorite here is the Acoustic Research Powered Partner 22.

Acoustic Research Powered Partner 22 ($109)

The Powered Partner 22 is the entry-level model from the well-respected manufacturer of home stereo speakers, Acoustic Research. This famous speaker company has only recently begun to break into the computer speaker market. If the speakers from them in this survey are anything to go by, they should gain wide acceptance and success quickly once the word gets around. The only drawback is that the company has yet to find wide distribution for these speakers, so they may be a little hard to find—but the search is worth it.

The Partner 22 speakers (Figure 12-2) are very small in size and should fit in a nook on a crowded desktop. A power on/off button is hidden away in the back, while the single volume control is conveniently located in the front. Though these speakers lack any tone controls, they are far from lacking in terms

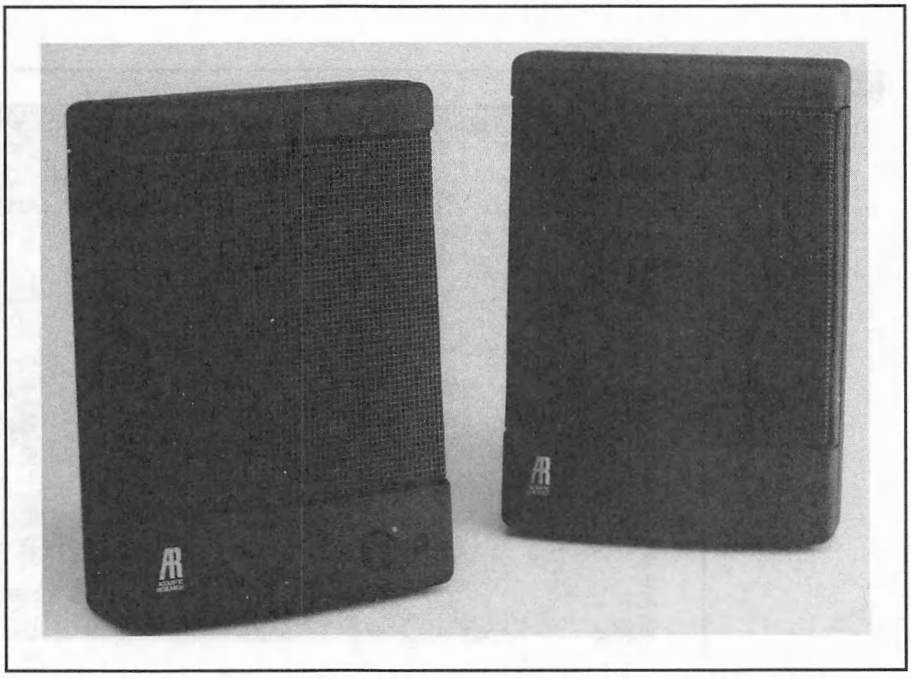


FIGURE 12-2 *The size of the Acoustic Research Powered Partner 22 belies its good sound*

of hardy construction and sound quality. The sound from the Partner 22 is natural and clear. It plays with a surprisingly adequate level of bass for a speaker its size. This speaker did not sound boomy or hollow at any time. The Partner 22 is a good speaker and is a bargain at the asking price.

Koss HD/4 ($59.99), HD/6 ($99.99)

The HD/4 is Koss's middle-of-the-pack offering. It sports a three-band equalizer instead of the normal bass and treble controls, allowing you to control bass, treble, and the midrange. Not bad for speakers that only cost about $60.

The top-of-the-line HD/6 (Figure 12-3) is priced in Koss's catalog at right around $100. It features an automatic battery-saving circuit that shuts the speakers off when no signal is detected. A power on/off button can be found in the back of the speakers. The front of the speakers have a bass boost button that did very little in terms of extracting real gut-wrenching bass from these speakers. However, as expected of speakers in this price range, the bass performance was definitely an improvement over the lower price offerings. Still, the speakers sounded a little bright and hollow for our taste.



FIGURE 12-3 *The Koss HD/6 can be used with batteries or AC power*

Labtec CS-550 ($59.95), SS-700 ($69.95), CS-900 ($129.95), CS-1000 ($149.95)

These Labtec speakers are not only widely available, they're fairly popular as well. The CS-550 is included with some Media Vision multimedia upgrade kits. It is a good starting speaker with moderate sound quality. The SS-700 features a three-band equalizer but does not include an AC adapter.

The CS-900 sounded the best of the Labtec bunch, with fairly good midrange clarity and adequate bass. We like the single volume, bass, and treble controls. It also features a convenient headphone jack.

The CS-1000 (Figure 12-4) is unique in this survey as it is the only all-in-one unit that fits under a monitor. Because the left and right speakers are closer together than normal, the stereo effect of music is diminished. A separate speaker produces the bass, but there isn't much of it to speak of. These speakers are valuable to those of you who have no space for speakers other than under your monitor. Others may want to look at the CS-900 or elsewhere for better sound quality in this price range.

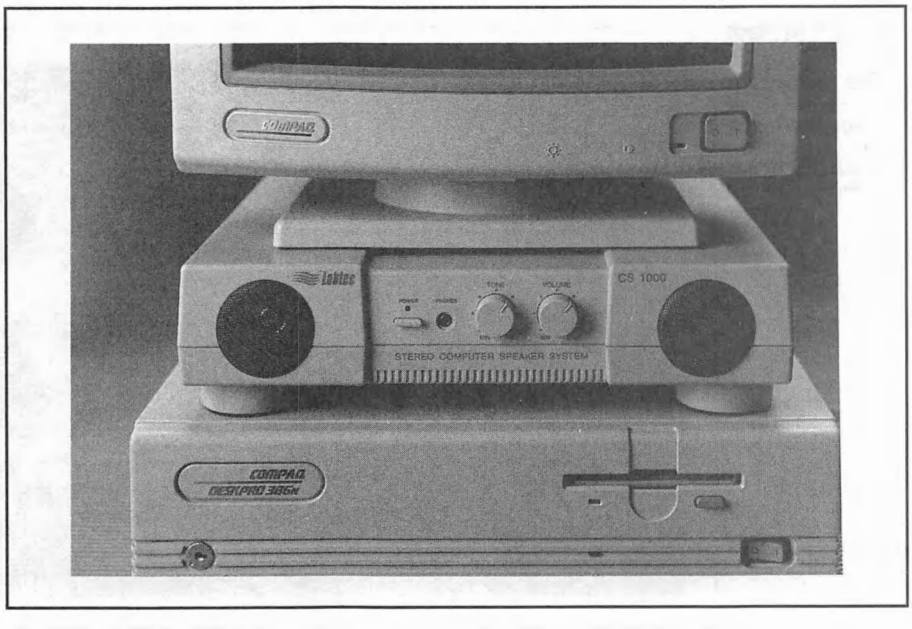


FIGURE 12-4 *The Labtec CS-1000 fits neatly under a monitor*

Persona Technologies Persona Micro ($99)

The Persona Micro (Figure 12-5) is one of the most compact speakers we surveyed. It features separate bass and treble boost buttons in the front of each speaker together with the volume control. Like most other speakers, the power on/off button is hidden away in the back. The speakers feature a power saving circuit that comes on with a fairly loud click whenever it detects an audio signal.

The bass from these speakers is anemic at best, which is okay considering that the midrange and treble sounded pretty good. The sound lacks the punch and drive of the Acoustic Research Powered Partner 22 and Koss HD/6. The included Velcro pads make mounting these lightweight speakers onto the side of your monitor fairly easy. The manual is well done (a good trait of all the Monster Cable speakers in our survey) and all cables and power supply are included.

Sony SRS-58PC ($129.95)

The SRS-58PC (Figure 12-6) from the electronics giant is a good speaker system flawed by an annoying power-saving circuit. It consistently cuts out the beginning of any sound clip, due to the slight delay as the circuit turns the speakers on after they've been automatically turned off. A switch is

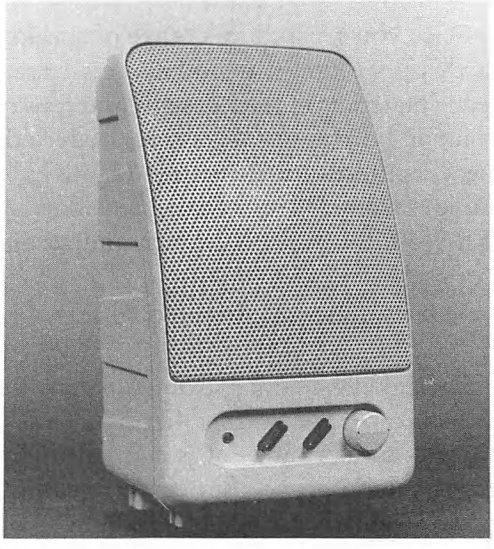


FIGURE 12-5 *The Persona Micro has a lilliputian footprint*



FIGURE 12-6 *The Sony SRS-58PC has a bypass switch to turn off its built-in amplifier*

provided to bypass the built-in amplifier, thus disabling the power-saving circuit. However, this defeats the purpose of using powered speakers. Ignoring the one flaw, the SRS-58PC is a fair performer on all counts, providing good competition to the other speakers in this price range.

Good Full Range ($150 to $300)

Once you get into this range of speakers, you're not likely to turn back. At this price range, manufacturers have more latitude and budget to use better materials in their designs and thus produce better-sounding products. You will find the speakers here produce the most bang for the buck. All the speakers in this category sound quite good. We especially like the Monster Cable Persona PC for its excellent Sonic Imaging enhancement and the Sony SRS-88PC for its superior bass and accompanying good looks.

Acoustic Research Powered Partner 42 ($199)

The middle offering from Acoustic Research turns in an overall good performance. The Partner 42 (Figure 12-7) fits squarely in the middle when it comes to its sound—it is neither bright nor does it produce particularly strong bass. What you hear are very natural sounding speakers. The requisite power supply is included and a power on/off switch is located in the back

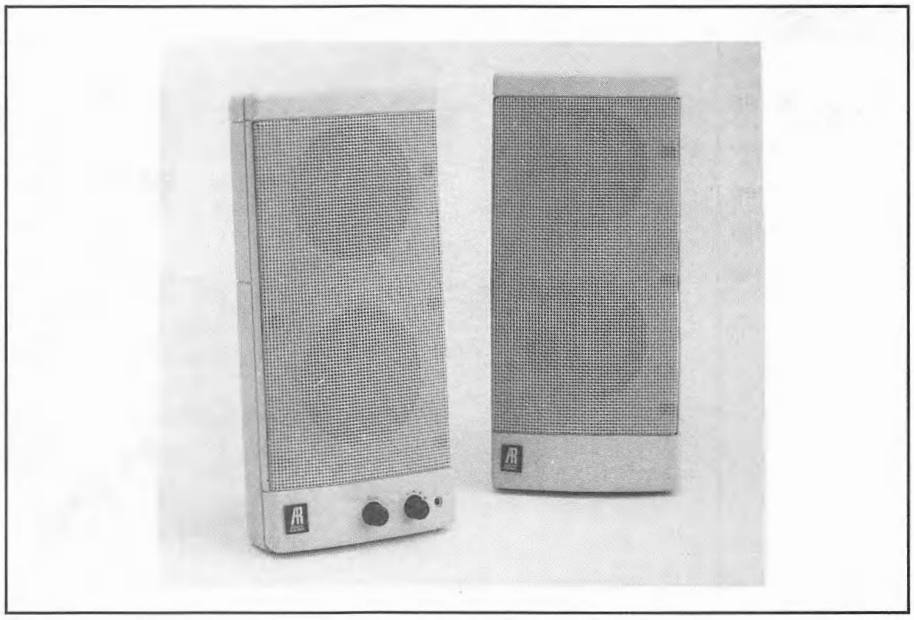


FIGURE 12-7 *The Acoustic Research Powered Partner 42 is tall, handsome, and capable of good sound*

of the speakers. Acoustic Research adheres to its basic design principle of having as little electronics and circuits between the source and the speakers as possible for the truest sound. You'll find nothing more than a single volume knob and a bass control on the front panel of the right speaker. The tall speakers feel substantial in their build quality and are quite handsome as well.

Altec Lansing ACS 100 ($180)

This is the entry-level speaker offering from Altec Lansing. The speaker design is certainly one of the most unique we've seen. The ACS 100 (Figure 12-8) features a fold-up tweeter, which makes the speakers look like Cyclops when the tweeters are in the upright position. Its strengths are its ability to accept two inputs and its lively sound. The treble produced on the ACS 100 can be described as crisp and clear, but distortion is very evident when played loudly. The DSP circuit is fairly good at presenting a wider stereo sound, but adds considerable hiss at the higher levels.

While the ACS 100 includes a treble control, it lacks a bass control. Because the treble control lacks a center mark, we couldn't quite figure out the middle setting. The bass is clean, but lacks the punch of the Sony SRS-88PC. It was nice to see all the necessary cables and power supply included; and the manual clearly diagrams the connections that need to be made.



FIGURE 12-8 *The Altec Lansing ACS 100 has a unique look and crisp sound*

Persona Technologies Persona PC ($229)

The Persona PC speakers (Figure 12-9) have a unique and attractive look. They are notably lightweight and can be easily attached to the sides of a monitor with the included stick-on Velcro pads. The cables included with the speakers are of unusually high quality with gold-tipped plugs. This is not so surprising considering the source of the speakers—Persona Technologies is owned by Monster Cable, world-renowned for their speaker cables and hi-fi component interconnects.

Not only did the quality of documentation and well thought-out design of the Persona PC impress us, but the speakers also proved capable of producing very good sound quality. The Persona PC has the best sound enhancement circuit (called Sonic Imaging by Monster Cable) of the speakers we tried. The effect of Sonic Imaging can be varied over a range with a dial similar to a volume control. One attribute that rockets Sonic Imaging to the top of our preferred list is the consistently natural-sounding effect the circuit has on music. With the Persona PC, we can turn off the worse-sounding Treble Enhance circuit of the Pro Audio sound card and use Sonic Imaging for a more satisfactory sound.

A headphone jack is included. This jack will come in handy sometimes—especially when it's two in the morning and you're still playing computer games while others are asleep.

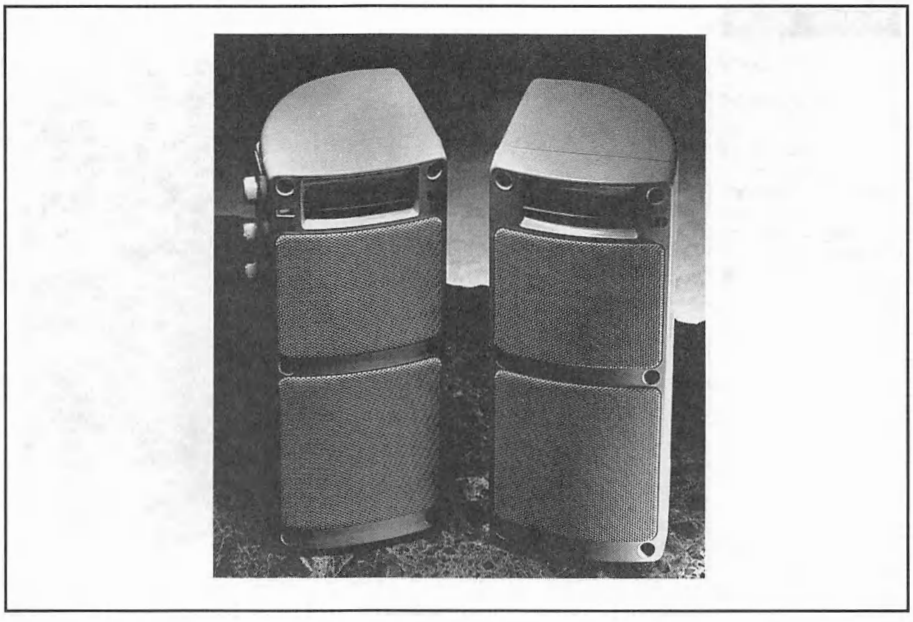


FIGURE 12-9 *The Persona PC has a good sound enhancement circuit called Sonic Imaging*

Sony SRS-88PC ($199.95)

The SRS-88PC (Figure 12-10) has a very plush and attractive design. Instead of the industrial look, the front grill is covered with an aesthetically pleasing light beige fabric matched to the color of the speaker cabinet. Separate power switches, volume, and tone controls are located on both left and right speakers. The separate controls make adjusting volume and tone difficult, as you have to match the settings on both speakers whenever you make a change to one. While most speakers use a power supply, the SRS-88PC plugs directly into an AC outlet.

The main drawback to these speakers for us is that it adversely affected the monitor in our test system, even though it is supposedly magnetically shielded. We had to move the speakers to at least four inches away from the sides of the monitor to eliminate the flickering induced by the proximity of powered-on SRS-88PC speakers. Interestingly, the speakers did not affect the monitor when they were off. This leads us to believe that the power supply within the speaker cabinet may be the culprit more than the speaker magnets. Bear in mind that your monitor may not be affected at all.

Barring the minor monitor interference problem we had with the SRS-88PC, we can highly recommend that you audition these speakers. With the Dynamic Equalization Circuit (DES—Sony's description for what is essentially a tone control) set to the middle position, the speakers exhibit a good



FIGURE 12-10 The Sony SRS-88PC features good bass and overall performance

amount of bass. Voices are crystal clear, while cymbals and other high-pitched notes sound natural. These speakers definitely hold their own against the competition.

The Best and Most Expensive (over $300)

The following are the creme de la creme—the best of the best in the arena of powered speakers. They are expensive, all of them costing more than what you pay for a Pro Audio sound card. But they're worth it, from the time the first note plays to the long game sessions with accompanying feet-tapping music and heart-pounding sound effects. This is a lot of money to spend just on speakers for your computer, but the best is never cheap. If you've never listened to any of the speakers in the following list, you owe yourself a favor to run down to the nearest dealer for a demo. You're in for a whole new experience and you'll rediscover your Pro Audio sound card's capabilities.

Some of the speakers described incorporate a satellite/subwoofer configuration. These systems usually comprise three speakers—right and left speakers, known as the *satellite* speakers, and a *subwoofer* that is used to produce the lower bass registers. The subwoofer can sit on the floor, while the satellites are usually placed beside your monitor. Refer to the section later in this chapter, "Subwoofers—Feeling the Sound" for information regarding a separate subwoofer that can be used to supplement almost any speakers.

Acoustic Research Powered Partner 622 ($349), 570 ($399)

The Partner 622 system (Figure 12-11) consists of three speaker enclosures. The left and right speakers are small units similar to the Partner 22 in size; a much larger unit, the subwoofer, goes on the floor. The output from the Pro Audio sound card connects to the subwoofer, and the left and right speakers then connect to the subwoofer. There is thankfully only one AC power cord to deal with, and it's connected to the subwoofer. This cabling scheme prevents cable clutter, as most of the cabling can be hidden away with the subwoofer beneath a desk.

The volume, treble, and bass controls are located on the subwoofer. Because this unit is likely to sit on the floor somewhere under your desk, it is inconvenient to adjust these levels. We found ourselves adjusting the levels on the subwoofer during the setup, and then resorting to the Pro Audio's mixer controls for routine adjustments—a simple sacrifice we willingly made, considering the excellence of the unit.

The Partner 622 is one of the best-sounding powered speakers we have encountered, second only to the Partner 570 in some respects. They produce the best bass among all the speakers surveyed, no doubt due to the largish subwoofer. The sound coming from the left and right speakers belie their size. Without telling your friends about the subwoofer, you will truly amaze them with the wonderful clean, clear, and deep sounds coming from these speakers. They play very loudly as well, enough to drive your neighbors crazy. The Partner

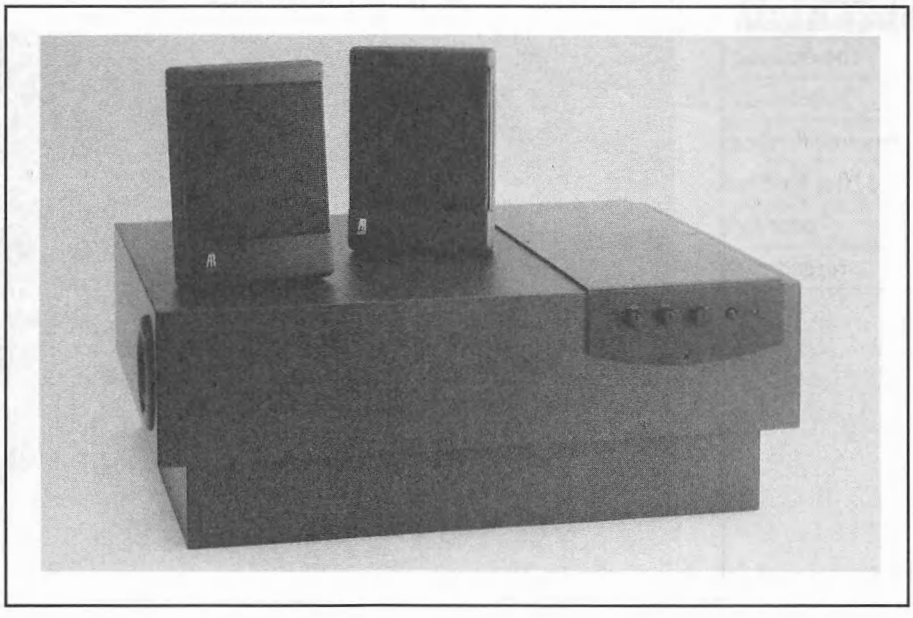


FIGURE 12-11 *The Acoustic Research Powered Partner 622 dominates with its big subwoofer and fantastic sound*

622 is one of the handful of speaker systems good enough to be used in a small home stereo setup in conjunction with a portable CD player.

The Partner 570 (Figure 12-12) is the largest and heaviest speaker we tested. The heft contributes to the overall impression of very substantial speakers that can be carted around without worry. In fact, unlike other speakers, the outer casing is made of sturdy metal. Optional brackets are available for mounting the speakers onto a shelf, desk, or wall. The triangular-shaped speaker can be placed on its side, instead of the usual upright position.

The speakers are magnetically shielded, but they still caused a slight yet annoying flicker when placed beside the monitor in our setup. Moving the speakers at least six inches away from the monitor solved the problem. Having to keep the speakers at a distance from the monitor, along with their size, means that you'll need to own a larger piece of desktop real estate to properly place the Partner 570. The regular volume, bass, and treble controls can be found separately on each speaker while the power switches are placed on the back of the enclosures.

The sound of these speakers can only be described as exemplary. They do not produce the volume of bass that the Partner 622 does, but they possess the best balance of them all. The midrange is especially good, sounding clear and detailed without being hollow. It also produces good depth and imaging without resorting to any sound enhancement circuits. After listening to the many speaker systems, the Partner 570 is like a breath of fresh air. You're immediately captured by its effortless ability to produce a sound that is

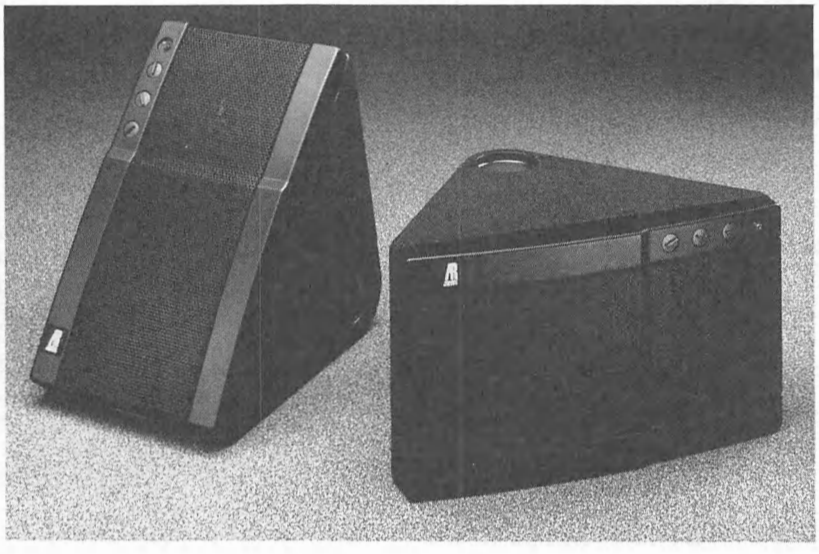


FIGURE 12-12 *The Acoustic Research Powered Partner 570 is hard to beat for ruggedness*

undoctored and to play loudly without a hint of distortion. The Partner 570 should be right at home in any computer or personal stereo system.

Altec Lansing ACS 200 ($300), ACS 300 ($400)

Altec Lansing delivers the ACS 200 and ACS 300 (Figure 12-13) as their best offerings for powered speakers. Just like Acoustic Research, Altec Lansing has already established themselves as a well-respected speaker manufacturer for home stereo speakers, and now for computer speakers. The ACS 200 is actually a scaled-down ACS 300, without the subwoofer included with the latter. For all intents, the ACS 200 sounds like its more expensive sibling but with reduced bass capability. Because the ACS 200 and ACS 300 are alike in sound quality except for the bass, we'll describe them here together.

The most unusual feature of these speakers is the unique clamshell design. If there is a purpose to this design, it is not readily apparent. What is apparent are the many thick cables used to connect the individual speakers together. First, you have cables connecting the left and right speakers. Then AC power cords go from the AC outlet to the subwoofer (only on the ACS 300). From there, separate power and audio cables snake to the satellite speakers. Add to that the audio signal cable that goes between the Pro Audio card and the speakers, and you have a mess of wires on your hands. Making all the right

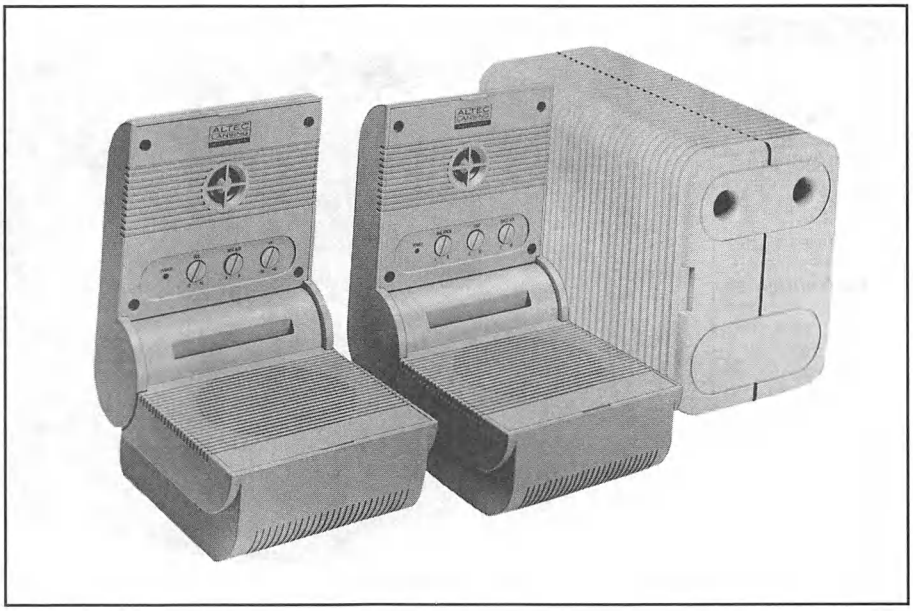


FIGURE 12-13 *The Altec Lansing ACS 300 adds a subwoofer to the original two-speaker system of the ACS 200*

connections is simple if you follow the well-illustrated manual, but this task is not for the faint-hearted. One of the niceties of the ACS 200 and ACS 300 speaker packages is that they include wall-mounting brackets.

Once you get the speakers up and running, they actually sound very good. The DSP circuit works fairly well, though it should be used judiciously—turn this effect up too much and you'll begin to wonder if all the speech was recorded in a very large hall (speech becomes muddy sounding). Hiss also increases proportionately with the use of DSP. Both the ACS 200 and the ACS 300 play loudly without distortion. However, the ACS 300 produces the extra oomph from its subwoofer—its bass reproduction was second only to the Acoustic Research Powered Partner 622. If you are shopping for speakers in this price range, both the ACS 200 and the ACS 300 deserve a serious audition.

Bose RoomMate Computer Monitor ($339)

Bose is another well-known speaker company who has ventured into the computer speaker arena. The RoomMate speakers (Figure 12-14) are fairly large in size, but you can purchase optional stands to mount them off your desk. The logo on the cloth grill can be easily rotated to accommodate a vertical or horizontal speaker orientation. There is one lone volume control on the front of the left speaker. All the necessary cables and power cords are included in the package.

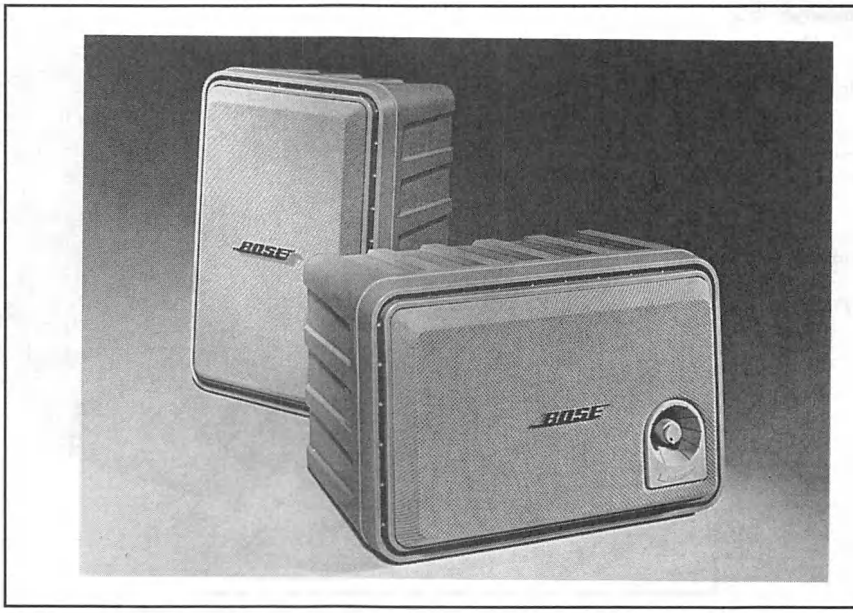


FIGURE 12-14 *The Bose RoomMate Computer Monitor can be used either horizontally or vertically*

The sound from the RoomMate speakers is neutral, with neither a bass nor treble emphasis. You can obtain good fidelity from these speakers at moderate volume levels. Overall, the RoomMate performs fairly well, but it is definitely out of the league of speakers such as the Acoustic Research Partner 622, Partner 570, and the Altec Lansing ACS 300.

Subwoofers—Feeling the Sound

Almost everyone considers the bass quantity produced by speakers to be an important consideration when purchasing speakers. Low bass signals are not only heard, but felt as well. Most of you have probably felt your seat (and bones) vibrate from the low bass in movie special effects at the theater. A special type of speaker, called the *subwoofer,* is usually used to play back these very low-pitched sounds.

A sure way to add gut-wrenching bass to any speaker system is to use a subwoofer. A listener cannot tell the direction of low bass, so only one speaker is used in a subwoofer for both left and right channels. This speaker is usually housed in a separate unit from the satellite speakers (the left and right speakers) that produce the directional midrange and treble. The subwoofer unit can be conveniently placed separately and away from the satellite units. You can add a subwoofer to any existing two-speaker setup to upgrade the abilities of those speakers.



TIP: *Adding a subwoofer can be the best and most dramatic upgrade you can make to your speaker system. If you're considering spending more than $200 for new speakers, consider adding a subwoofer for your existing speakers first. The results may save you some money.*

Altec Lansing ACS 150 ($200)

The ACS 150 subwoofer (Figure 12-15) can be easily added to any existing speaker system and provides the bass missing in many midrange speakers. The ACS 150 includes a Y-cable that plugs into your Pro Audio card. You then plug the output to the satellite speakers and the subwoofer into this cable. The ACS 150 has its own volume control to balance the sound with the satellite speakers. An AC adapter is included for the subwoofer as well.

Adding the ACS 150 to almost any speaker setup creates a dramatic and positive improvement to the bass of the speaker system as a whole. Explosions, machine guns, and aircraft engine special effects found in many games gain an extra dimension. Music with drums and bass guitar develops a new character, as these instruments are reproduced clearer than before.



FIGURE 12-15 The Altec Lansing ACS 150 subwoofer adds the knockout punch to your Pro Audio sound card

If you already own speakers in the $50 to $300 range, you should seriously consider the ACS 150 as your next speaker upgrade.

SOURCES AND PLACES TO PURCHASE SPEAKERS

There are many places where you can purchase speakers for your Pro Audio sound card. The most obvious is the place where you can purchase Pro Audio sound cards—your local computer store. The advantage of making a purchase in a local store is that you can probably preview or listen to the speakers before actually purchasing them.

Mail order is always an option when purchasing speakers. You'll probably get the best prices this way, but you will not be able to listen to the speakers before buying. Some mail order houses that we've had good experiences with are Tiger Software at (800) 888-4437, MicroWarehouse at (800) 367-7080, and The PC Zone at (800) 258-1233.

Below is a list of addresses and phone numbers for all the manufacturers whose speakers we tried in our survey. Contact them to locate a dealer who carries their products or for sales literature on their speakers.

Acoustic Research
330 Turnpike Street
Canton, MA 02021
(800) 969-AR4U or
(800) 969-2748

Altec Lansing
P.O. Box 277
Milford, PA 18337
(800) ALTEC 88 or
(800) 258-3288

Bose Corporation
The Mountain
Framingham, MA 01701
(508) 879-7330

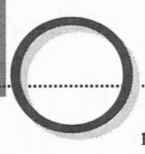
Koss Corporation
4129 N. Port Washington Avenue
Milwaukee, WI 53212
(414) 964-5000

Labtec Enterprises, Inc.
11010 N.E. 37th Circle, Unit 110
Vancouver, WA 98682
(206) 896-2000

Persona Technologies
274 Wattis Way
South San Francisco, CA 94080
(415) 871-6000

Sony Corporation of America
Sony Drive
Park Ridge, NJ 07656
(201) 368-9272

GETTING THE MOST FROM YOUR NEW SPEAKERS—SETUP AND POSITIONING



Once you purchase your speakers, here are a few hints on speaker positioning to be aware of. Experiment with the positions of the speakers on your desktop to find the ideal resting place for them. Any solid reflecting surface enhances the bass of the speakers. For example, putting the speakers next to a wall increases the bass; putting them in a corner increases the bass even more. This effect also works equally well with subwoofers.

Speakers should be placed at least 14 inches apart for the best stereo effect. Mounting them on the sides of your monitor may not be a good idea if you have anything less than a 16-inch monitor. Placing them too far apart is also not a good idea, because the stereo effect will sound unnatural.

Keep the audio speaker cables (the ones that connect the speakers to the Pro Audio sound card) away from the power cords if possible. If they must cross paths, try to cross them at a 90 degree angle. This helps eliminate radio frequency interference from the power source. You may still sometimes pick up certain radio transmissions from CB radios. If this happens, try repositioning and reorienting your audio cables.



TIP: *For those of you who own a Pro AudioStudio 16 or Pro AudioStudio 16XL, connect the speakers to the Line-Out connector (second from the top) on your card rather than the Speaker Out connector (first from the top). Line-Out provides a cleaner signal because it bypasses the amplifier built into the sound card. You do not need to use the amplifier in the sound card because powered speakers have their own built-in amplifiers.*

ABOUT MICROPHONES

The Pro Audio cards use almost any microphone with a 1/8-inch plug. The Pro AudioStudio 16 actually comes with a conveniently sized microphone that can be easily attached to the front of your monitor. Media Vision researched and found this microphone to work best with the voice recognition software included with the Pro AudioStudio 16. Otherwise, you can obtain this special microphone separately by purchasing the PowerPak upgrade for your Pro AudioSpectrum 16.

For those who work in a crowded or shared office, ambient noise makes using such a microphone impossible. To tackle this and other problems, Labtec makes a microphone that is conveniently integrated into a headset (Figure 12-16). The Labtec C-12 works well for those of you who use voice annotation or speech recognition in your daily work as well as for those in a noisy environment.

Almost any standard microphone, purchased from an electronics store, with the appropriate 1/8-inch plug at one end works fine with the Pro Audio sound cards. Media Vision has built in a wide tolerance for the type of microphone that can be used with the Pro Audio.

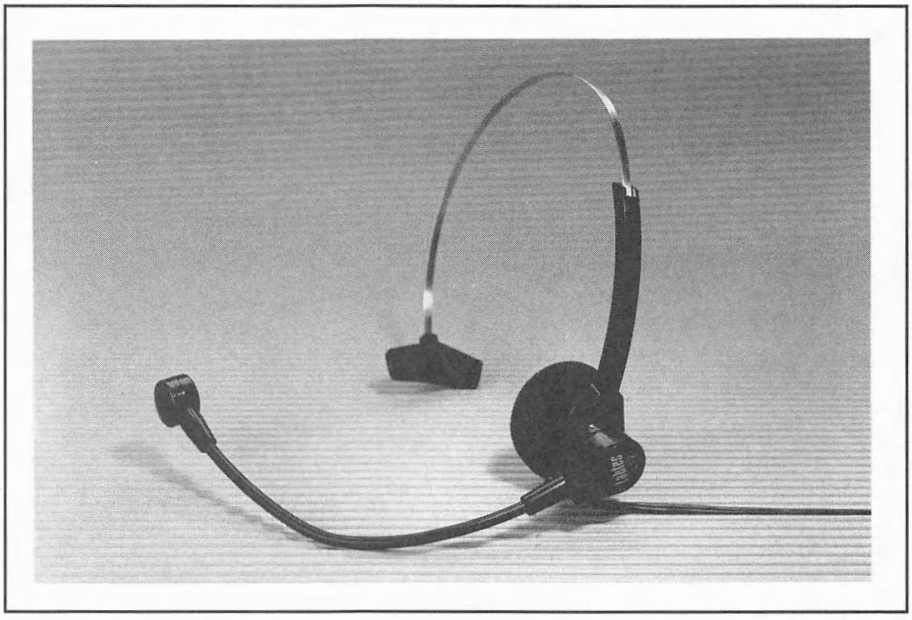
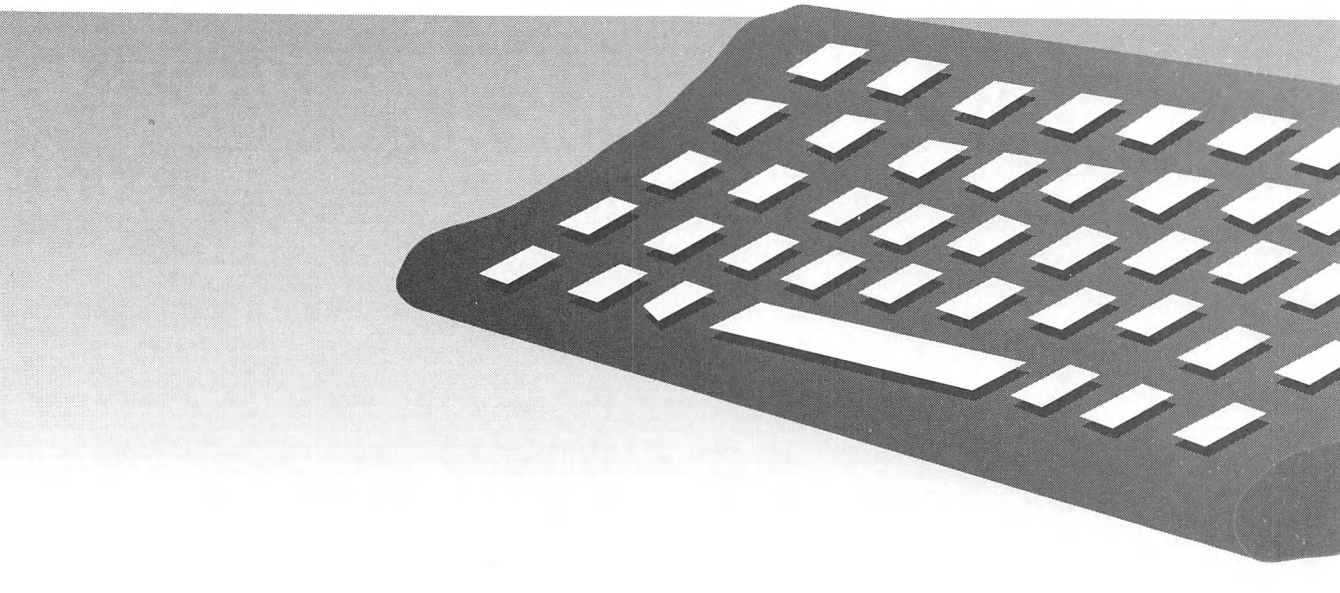
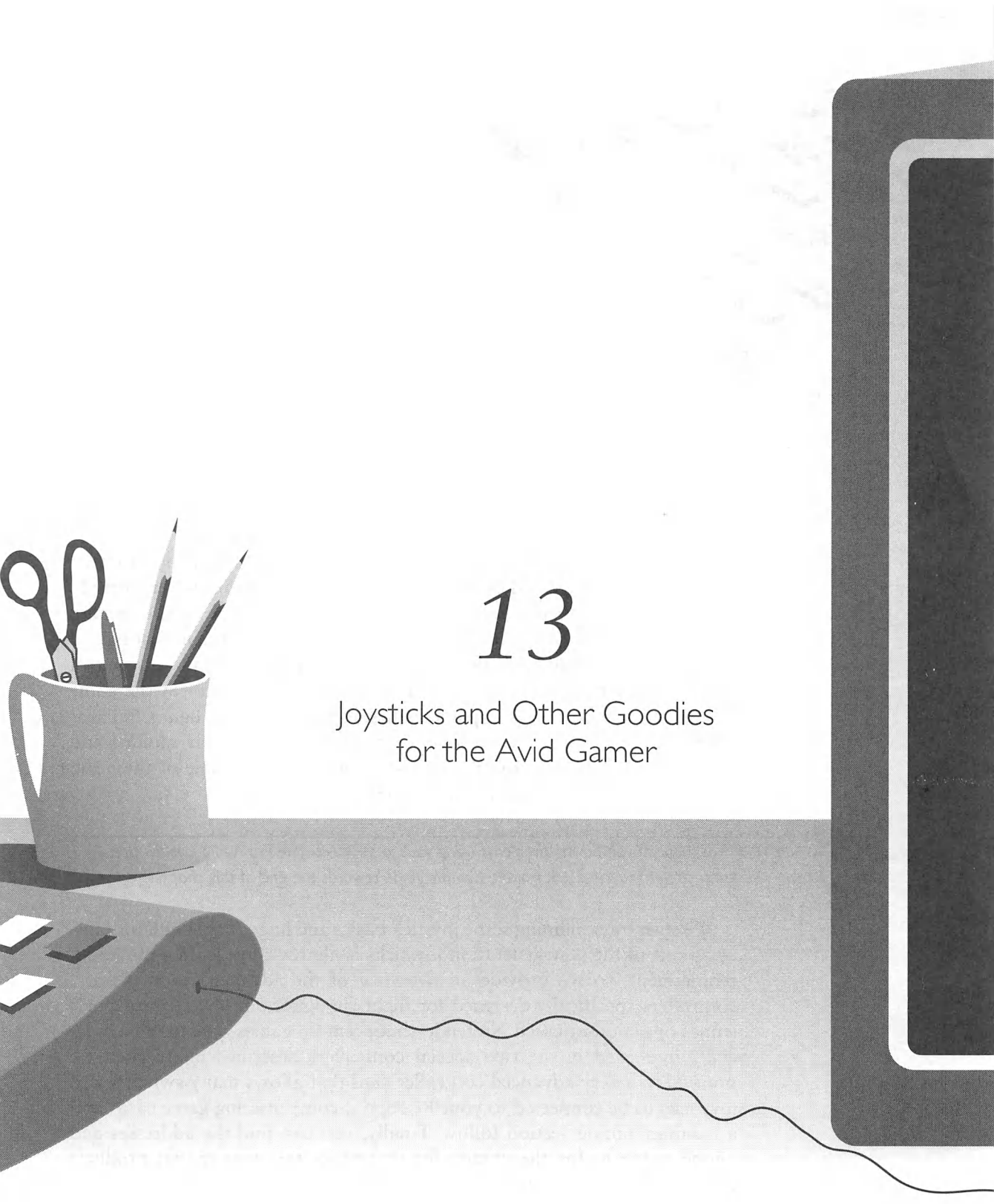


FIGURE 12-16 *The Labtec C-12 Headset and Boom Mic*



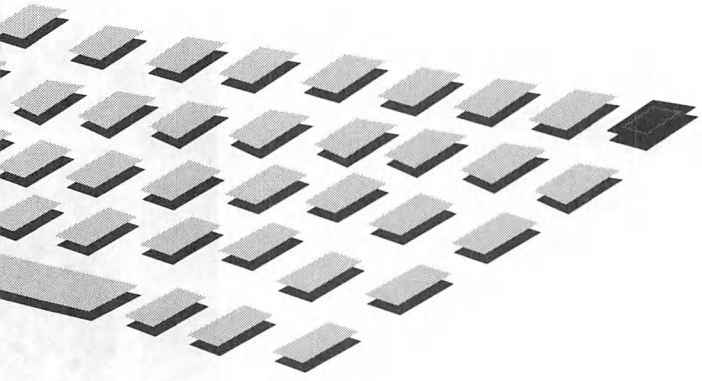
TIP: *Some microphones work better than others with voice recognition software. Before you decide to purchase or keep a microphone, test it with your voice recognition software.*





13

Joysticks and Other Goodies for the Avid Gamer



It is no secret that most of you purchased the Pro Audio sound card to enhance computer games. Media Vision's warranty card survey indicates that at least 85 percent of all registered owners use the Pro Audio card to play games. And Pro Audio is one of the most widely supported sound cards with software game publishers.

The advent of CD-ROM and multimedia is bringing about sophisticated sound and music, created by Hollywood-type professionals, to temporarily transport the gamer into another world. Part of the suspension of reality afforded by games (which includes flight simulators, driving simulators, and other simulators) can be attributed to sophisticated peripherals and control devices—they bring us a step closer to actually being there in the game environment. Increasingly capable games, especially in the flight simulator category, are creating a need for the use of today's uniquely molded and enhanced multi-button joysticks. This chapter explores some of these fun and useful accessories, joysticks, and peripherals.



TIP: *For those of you having problems using your joystick with the Pro Audio joystick port, jump straight to the quick troubleshooting guide towards the end of this chapter.*

We start by explaining some joystick basics and lingo. For simulator fans, using one of the new-generation joysticks is almost considered a minimum requirement, so we provide an overview of the advanced joysticks and controllers specifically designed for flight simulators. If you're into sports games or action-oriented Nintendo shoot-'em-up games, you may be especially interested in the two special controllers described next. Then we proceed to a very advanced controller card that allows many switches and joysticks to be connected to your PC. Speed-compensating game cards and a troubleshooting section follow. Finally, you can find the addresses and phone numbers for the companies that make the very special products described in this chapter.

We have been fortunate to have had the opportunity to experiment with all the devices described in this chapter. Remember, we didn't have a scientific way to thoroughly test each and every one of these. So what you're getting are our impressions and thoughts after many hours of first-hand experience and talking with the companies that make them.

JOYSTICK BASICS

The *joystick* is an easily recognizable controller that is the simplest of input devices. A joystick has a grip that is spring-centered and moves in two axes—forward/backward and left/right. The movement of the joystick itself usually moves the player's onscreen alter ego or directs the movement of a vehicle or an aircraft in simulators. Most joysticks can be used by the right or left hand. The standard PC joystick also sports the usual two buttons, A and B, whose functions vary depending on the game.

The convenient MIDI connector/joystick port built into the Pro Audio sound cards allows the gamer to attach some unique joystick and input devices that enhance most games. You can connect up to two joysticks to this port. You'll need a Y-cable, which you can purchase from any computer or software dealer, and a Midi Mate box, which you can order from Media Vision. (Review Chapter 8 for more information about the Midi Mate.) Some flight simulators support the use of the second joystick as both a *throttle* (forward/backward) and *rudder control* (left/right), while other games—like sports games—use two joysticks to support a multi-player game.

A joystick port can handle two joysticks or basically four axes. Note that specialized controllers like rudder pedals use only one axis of a joystick port, thus allowing another controller to use the other axis. A special cable, usually provided with rudder pedals (where this scenario is most applicable), is used to further split the x- and y-axes of the second joystick. Because the main joystick always uses at least two axes, you can have up to three controllers (one joystick, a throttle control, and a rudder control) hooked up to your PAS joystick port.

Extra buttons and controls on the enhanced joysticks are being utilized by many PC game publishers. These buttons allow you to use more game functions without having to look down at the keyboard to hit a key. For example, it can be very frustrating if you have to look away from a target to launch the rocket, then see that the enemy has moved away at the exact moment you were looking down. Having a button on the joystick, readily available and close to your fingers, allows you to keep your eye on the target.

Most games use a keyboard, mouse, and/or joystick, and this is usually clearly stated on the packaging. The advanced joysticks described in the

following sections are enhanced regular joysticks, so they work with any game that supports a standard joystick. Unlike the older games that were released prior to the introduction of these enhanced joysticks, most new games do provide additional support for the added buttons and switches.

Some joysticks include what are known as *trim controls,* or centering adjustments. Trim controls allow you to center the stick correctly, which may otherwise be impossible without adding a speed-compensating joystick port. Trim controls are allowed only if you have a 486/33MHz-or-faster machine or Pentium PC and you're using the joystick port in your PAS card.

SIMULATION CONTROLS

Simulators of all kinds have become increasingly sophisticated and accurate during the last few years. Our fascination with flight continues to be explored in the computer realm. Programs like Falcon 3.0, F15 Strike Eagle III, Tornado, and Flight Simulator 5.0 have redefined the standards for PC flight simulators, with accurate modeling of flight characteristics and physics. Recreating the many instruments and controls on airplanes has led to a proliferation of keyboard commands that have became awkward to use, and so the need for joysticks came about.

Flight simulators are not the only games where these enhanced joysticks work well. Driving simulators such as Indianapolis 500 and World Circuit, and space combat games such as X-Wing and the Wing Commander series all benefit from these specially designed and equipped joysticks.

Almost inevitably, the companies and their products represented below started as an idea to improve the founders' enjoyment of a game. Most started in a garage somewhere, with crude first-generation prototypes that are the very definition of home-brewed and amateur. Their current success is a clear indication that they're not alone in their goal to achieve new levels of realism in their own homes.



TIP: *While the joysticks described in this section are ideal for flight simulators, they can also be used for other types of games. Action/arcade gamers should look in the following section for the ideal joysticks for that purpose.*

CH Products

CH Products has been around since 1977 and is a family owned and operated company. Its founder, Charles Hayes (whose initials are part of the company name), still runs the company that manufactures a variety of

computer accessories, including joysticks and game cards. CH Products was, in its early days, known as Hayes Products. Since the name change in 1984, it has been a major supplier of joystick devices to computer gamers and hobbyists. CH Products also provides analog joysticks for use in medical instruments, such as ultrasound and powered wheelchairs, and military equipment.

CH Products has earned a large market share in the PC peripheral market by building quality products at reasonable prices. The products we've looked at are of consistently high quality. When the company makes a mistake, they are quick to admit and correct the problem. Case in point: a batch of Virtual Pilots (described below) that were manufactured in early 1993 had a defective part. CH Products not only publicly explained the defect (on CompuServe), they promptly offered to replace all such units free of charge. Action speaks louder than words, and CH has proven many times that they back their products one hundred percent.

The various joysticks manufactured by CH include the Mach series, which is suited for action-oriented games. The following are overviews of the more expensive and capable alternatives to the Mach series.

FlightStick (Regular: $69.95; Pro: $89.95)

The venerable CH FlightStick (see Figure 13-1) has been the standard joystick for PC flight enthusiasts for a long time. It was the first joystick to incorporate a throttle control in the base of the joystick, and it is perhaps the most well-known joystick product. The FlightStick is extremely well-built—the author's personal CH FlightStick works as well today as it did the first day it was purchased some two-and-a-half years ago. The mandatory two buttons on the contoured grip provide tactile feedback when pressed and are estimated to last for up to ten million shots! The throttle, situated along two trim wheels used for centering the joystick, is supported by a variety of games, including Flight Simulator 5.0.

The FlightStick has a light feel with very precise centering. It also has a long throw, which means it requires large arm motions to move the joystick from one extreme to another (top-left to bottom-right, for example). This works well with flight simulators because it provides very precise control over the direction of the joystick. However, a long throw is a disadvantage in many action games where you must often change directions quickly; the excess movements required by the FlightStick put you at a disadvantage when playing those types of games.

The FlightStick is the most popular and widely used joystick of its kind, as evidenced by its wide availability. You can purchase the FlightStick at a good discount almost anywhere, including Wal-Mart. You cannot buy a better stick for flight simulators at the asking price.

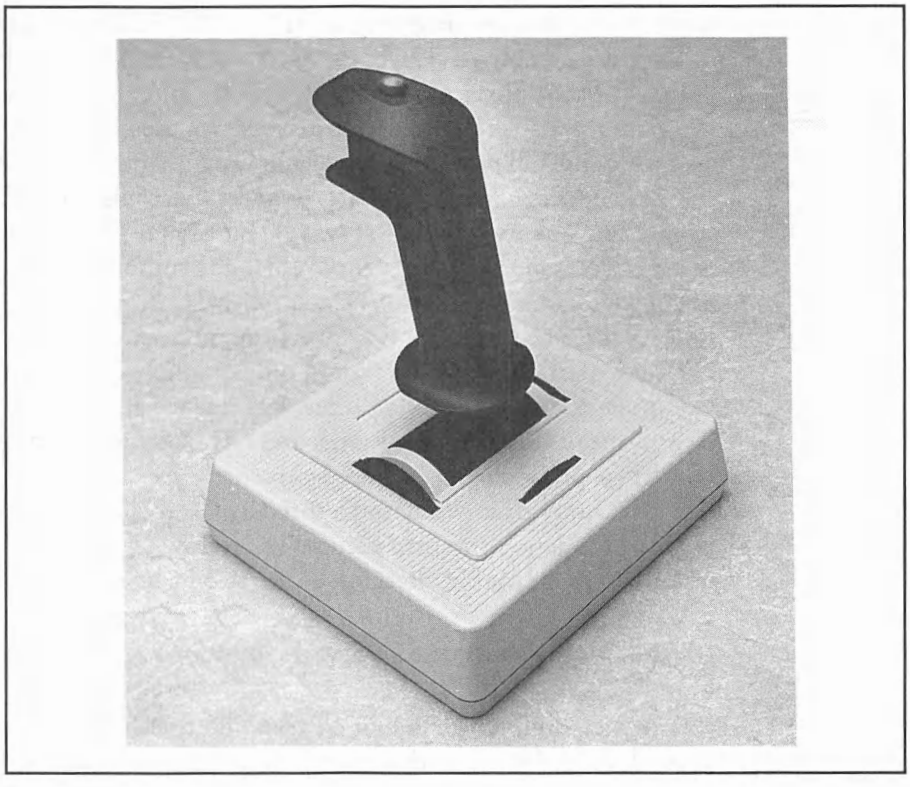


FIGURE 13-1 *The reliable CH FlightStick is the most economical entry-level joystick for flight simulator pilots*

The big brother of the FlightStick is the FlightStick Pro (see Figure 13-2). Built to the same standards as the FlightStick, the Pro features four buttons and a viewing switch. This viewing switch can be used for a variety of functions depending on the game, but it is primarily used for switching views. The extra buttons initiate different functions, also depending on the game. Some of the popular games that support the extra functionality of the FlightStick Pro include Dynamix's Aces Over Europe, LucasArt's X-Wing, Origin's Strike Commander and Privateer, and Microprose's F15 Strike Eagle III.

Virtual Pilot ($109.95)

The Virtual Pilot (see Figure 13-3) is a steering yoke that resembles the ones found in most small airplanes. Unlike joysticks, the yoke's movements are like a steering wheel that also moves forwards and backwards, identical to that of an airplane yoke. A throttle control is located in the upper-right side of the case, fire buttons are located under the thumbs, and two trim controls are conveniently placed within easy reach. The yoke is electrically identical to a joystick and works with the standard Pro Audio joystick port.



FIGURE 13-2 *CH Products' latest FlightStick Pro features a viewing switch and four buttons*



FIGURE 13-3 *The CH Virtual Pilot soars with incredibly lifelike yoke action*

The Virtual Pilot must be clamped onto the edge of a desk for proper operation. This is easily accomplished if you have a standard desk with an edge that is no thicker than about an inch; if you have a rounded or decorative edge on your desk, the Virtual Pilot may not clamp properly. Once firmly clamped on, the Virtual Pilot is a dream to use, and it stays in place during intense sessions when the yoke is pulled and pushed hard. It is nearly a foot wide, so it dominates most desks. You also need to account for some space (about four inches) behind the yoke to allow for the extension of the stick to which the yoke is attached. We found little room left on the desk for the keyboard, which had to be placed in an awkward position, making it difficult to access.

The Virtual Pilot is remarkable in its ability to simulate the feel of a real airplane yoke. The steering column worked precisely and afforded improved control when playing Microsoft's Flight Simulator. If you're not familiar with the feel of a yoke, it may take some time to get used to. It's definitely not suited for air combat-type games—the feel is all wrong; a CH FlightStick or ThrustMaster's Flight Control System works much better in that scenario. But for programs such as Microsoft's Flight Simulator and Sublogic's Flight Assignment: Air Transport Pilot, the Virtual Pilot is second-to-none.

The other excellent use of this particular yoke is in driving simulations. The Virtual Pilot works marvelously well with Microprose's World Circuit and Electronic Arts' Indianapolis 500. The level of improvement in control when playing these games using the Virtual Pilot over a keyboard, mouse, or joystick is immeasurable—you immediately gain better control of the car in the simulation.

All in all, the Virtual Pilot is worthy of serious consideration for those who frequently enjoy noncombat (civilian) flying or driving simulations. It is so well engineered that CH has submitted the yoke for approval to the Federal Aviation Administration (FAA) for pilots logging hours on their stringent pilot exams. If approved, it'll be the first FAA-approved PC hardware for such a purpose—a testimony to the excellence of the Virtual Pilot.

ThrustMaster

ThrustMaster is a company that started literally from a garage. Buzz Hoffman, one of the founders, is a former F-16 jet fighter pilot who decided to make an enhanced stick for playing an air-combat flight simulator. At the time he started, the other joysticks on the market were lacking in several features found in the real joystick he used when he was flying. The rest is now history, and ThrustMaster today is considered by most jet simulator pilots as the premier supplier of flight control systems for the PC.

ThrustMaster completely redefined the jet fighter joystick market when they first introduced their enhanced joystick. Since then, the military has ordered specially made stick controllers from ThrustMaster for use in their expensive and advanced flight simulators. Much of their research while designing and making these high value sticks has carried over into their less expensive counterparts designed for the consumer.

The passion for quality and value at Thrustmaster is reflected in the products. As a young company, ThrustMaster has garnered a surprisingly strong and loyal user base. Their support is second-to-none: this is one of the very few companies we've come across that fixes a product under warranty under any circumstances—a highly commendable policy.

The three mass-market consumer-oriented ThrustMaster products are: the Flight Control System/Pro-Series Flight Control System (FCS/PFCS), the Mark II Weapons Control System (WCS), and the Rudder Control System (RCS).

Flight Control System (FCS: $99.95; PFCS: $149.95)

The Flight Control System (FCS) is a multi-button, multi-function joystick molded from an actual stick grip used in most modern-day jet fighter aircraft (see Figure 13-4). It has a trigger and three buttons. The trigger and one of the buttons correspond to buttons A and B that you find on regular two-button joysticks. One of the extra buttons is placed halfway down the handle on the left side and is operated by your thumb. The other extra button is located at the forward base of the stick and is operated with the pinkie finger. The FCS is designed for right-hand use and features a rest for the edge of your palm on the right-side base of the stick. This rest is the same as the rest found on a real jet fighter stick.

Probably the most eye-catching feature of the FCS is a five-position switch located at the top of the handle that looks like a Chinese hat (or coolie hat). This switch is referred to simply as the *hat switch*, used for a variety of functions depending on the game. For instance, in Aces of the Pacific, a World War II-era combat flight simulator, the hat switch is used to change to forward, up, rear, left, or right views, depending on which direction the thumb-operated switch is pushed. In MiG-29, an add-on disk to the popular Falcon 3.0, the hat switch is used to trim the aircraft. Its use on PC joysticks was pioneered by ThrustMaster.

The Pro-series Flight Control System (PFCS) is identical in form and function to the FCS, except for many upgraded components. For example, the torsion springs cause the PFCS to produce increasing tension the farther you move the stick off-center in any direction, which feels dramatically different than the FCS. The FCS, on the other hand, feels very much like a CH FlightStick, with a light but very precise feel. The added tension on the



FIGURE 13-4 *The pioneering ThrustMaster Flight Control System (FCS) is shaped like a real fighter jet joystick*

PFCS attempts to simulate the feel of aerodynamic feedback in a real aircraft. The increased tension means a greater amount of effort to operate, which is tiring during long gaming sessions. The PFCS is more suited for flight simulators like Falcon 3.0, and less so for more action-oriented shoot-em-up games like X-Wing or Wing Commander—the FCS is better suited for the constant maneuvering required.

All major flight simulator game publishers recognize the advantage of ThrustMaster controls and are providing direct support for the FCS/PFCS in current and future games. However, the FCS and PFCS also work as normal two-button joysticks with all games that do not support their added functionality. To use the two extra buttons and the hat switch in older games, ThrustMaster sells TSR programs (defined in Chapter 3) that allow the user to program these switches to perform any single key function supported by the game. Currently, optional TSR programs are available for the LucasArts games (Battlehawks, Battle of Britain, Secret Weapons of the Luftwaffe, and X-Wing); Falcon 3.0 (all versions and Operation: Fighting Tiger); several MicroProse simulations (F-15 Strike Eagle II, F-19, F-117A, and Knights of the Sky); and Dynamix's Red Baron. The price of each TSR is $15.95 plus $2 shipping and handling. Many games feature full support of the FCS and PFCS four buttons and hat without extra TSR programs. A truncated list

includes Aces of the Pacific, Aces Over Europe, Strike Commander, Tornado, MiG-29 (Falcon 3.0 add-on), F15 Strike Eagle III, and Comanche: Maximum Overkill.

Mark II Weapons Control System ($149.95)

The ThrustMaster Mark II Weapons Control System (WCS) is a throttle/weapons control, and like the FCS, it is modeled after the typical throttle/weapons controls of a modern jet fighter (see Figure 13-5). The Mark II WCS is a left-handed control that, unlike a regular joystick, only moves backwards and forwards for adjusting the throttle setting. On the throttle handle are six push-button switches and a three-position rocker or cradle-like switch. The rocker switch allows up to 18 functions with the six buttons, depending on the position of the rocker switch. These buttons can be programmed to perform a variety of functions such as operating the landing gear or speed brakes, changing radar and map modes, or arming and firing a missile or rocket.

The Mark II WCS is fully user-programmable. Every function, the throttle, the six buttons, and the rocker switch can be easily customized. The instructions used for programming it are fairly easy to learn. We love the flexibility to customize the setup to one's taste. For instance, you may

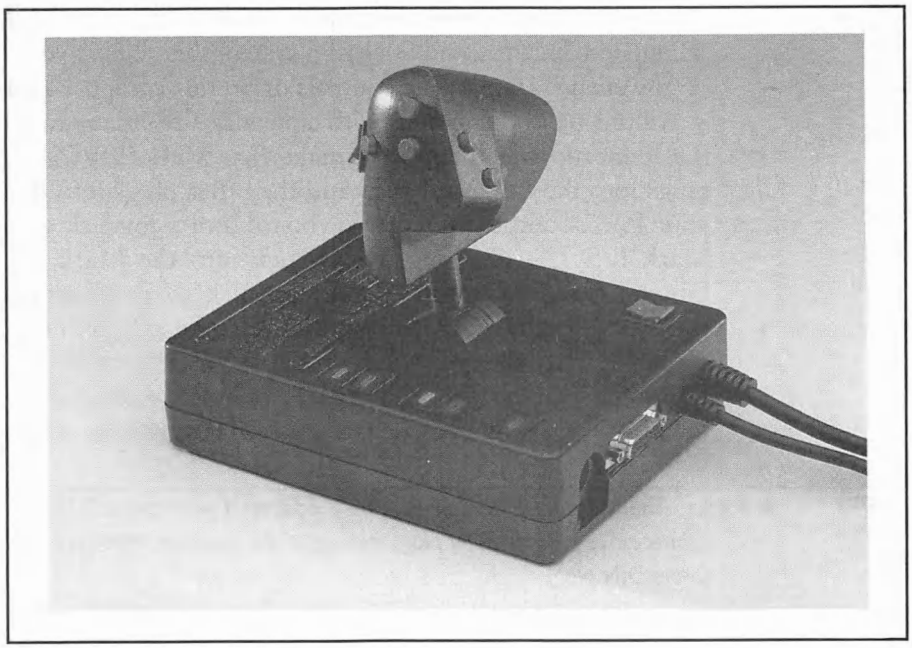


FIGURE 13-5 *The programmable ThrustMaster Mark II Weapons Control System (WCS) is a very flexible throttle control*

program the rocker switch to retract the landing gear when in the up position, while someone else can program the same button to raise the flaps.

Individual program files containing instructions for different games are loaded into the Mark II WCS memory before running the actual game. These program files can be easily modified with a text editor. All the programmable functions are explained in the manual, which is a little vague in some areas. However, a quick call to ThrustMaster should solve any programming questions you may have. Several program files are included on a disk for popular programs like Falcon 3.0, Flight Simulator 4.0, Tornado, X-Wing, Aces of the Pacific, Comanche: Maximum Overkill, and others. Since these files are small, users are encouraged to share their program files, and many can be found in the Flight Simulation Forum (FSFORUM) on CompuServe.

A separate program called ReMap provides additional functionality and programmability to the Mark II WCS for those more technically inclined. A lot of different scenarios can be programmed into the Mark II WCS using this additional program. Describing all the programming options available with the Mark II WCS and the ReMap software would take up a whole chapter by itself.

The main idea behind the Mark II WCS is to let you keep your left hand on the throttle and your right hand on a joystick while engaged in air-air or air-ground battles. You don't have to shift your eyes from the screen while you hunt and peck for keys on the keyboard. A famous adage among fighter pilots is "Lose sight, lose the fight." Thus the ThrustMaster FCS/PFCS and Mark II WCS together comprise what it known in the military as HOTAS (Hands on Throttle and Stick)—a system that allows you to keep your eyes on the enemy and not the controls or, in this case, the keyboard.

All this flexibility comes with a penalty—the many number of cables and the connections you'll have to make. The Mark II WCS has two cords. One plugs into the keyboard port and the other plugs into the joystick port on your PAS sound card. Your keyboard and a joystick are plugged into the Mark II WCS. Plugging the joystick into the Mark II WCS allows the functions of the buttons on the joystick to be programmable. You can program any joystick (it doesn't have to be a FCS/PFCS) via the Mark II WCS, but only the hat switch on the FCS/PFCS can be programmable. The view switch on the CH FlightStick Pro cannot be programmed with the Mark II WCS in this way because it uses a different wiring scheme.



NOTE: *The Mark II WCS requires a PS/2 adapter if you have a PS/2-style keyboard connector (6-pin mini-DIN plug) instead of the standard IBM keyboard connector (5-pin DIN plug).*

The WCS is one of a kind, and in its Mark II incarnation is more flexible and useful than ever. ThrustMaster believes that the memory in the Mark II WCS can be reprogrammed at least 100,000 times before it fails. Adding the Mark II WCS to your computer markedly improves the quality of any PC flight simulator.

Rudder Control System ($149.95)

The ThrustMaster Rudder Control System (RCS) is a rudder system designed to provide users with the realistic feel and precision control found in real aircraft rudder pedals (see Figure 13-6). The RCS is constructed of gold-anodized aluminum and contains two durable black plastic pedals with heel cups spaced a comfortable 16 inches apart. The pedals move straight forward and backward, automatically centering (via springs) to the center position. When one pedal is pushed forward, the other pedal moves rearward by the same distance, so control is maintained with both feet just as in the real aircraft.

The RCS plugs directly into the joystick port on your Pro Audio sound card. Your joystick then plugs into the Y-connector included with the RCS. Installation is a breeze and takes only a couple of minutes. If you're connecting a Mark II WCS and FCS/PFCS to the joystick port as well, the RCS remains plugged into the joystick port, the Mark II WCS plugs into the RCS Y-connector, and the FCS/PFCS plugs into the Mark II WCS.

The RCS adds another level of realism to simulators that support its function. It is very well made, very sturdy, and operates flawlessly in conjunction with the Mark II WCS and FCS/PFCS. Some of the programs

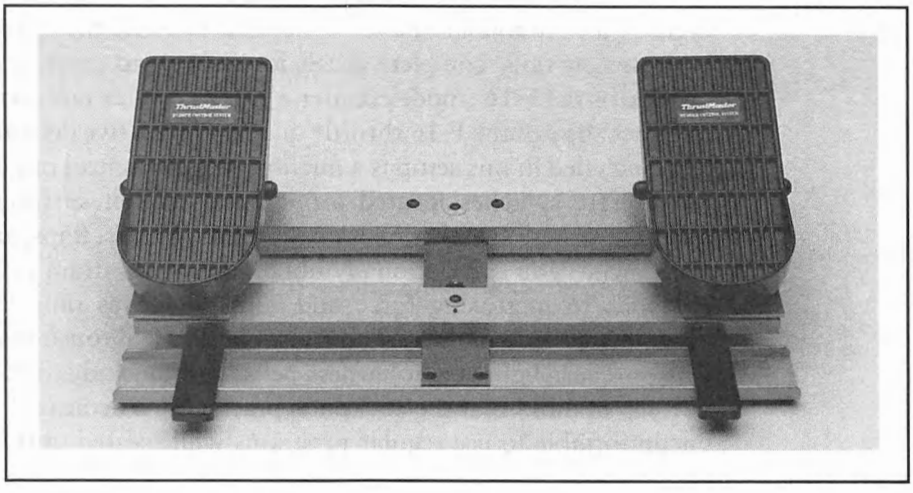


FIGURE 13-6 *ThrustMaster's Rudder Control System (RCS) does a good job of emulating actual aircraft rudder pedals*

that support the RCS include Aces Over Europe, Aces of the Pacific, MiG-29 (Falcon 3.0 add-on), and Comanche: Maximum Overkill. One interesting use for the RCS is in World Circuit, a Formula One car racing simulation from Microprose, which allows the RCS to act like the gas and brake pedals. This game takes on a whole new life when the RCS is used in conjunction with CH Products' Virtual Pilot.

While rudder pedals can be useful in some simulations, they do not have a purpose in many others. The RCS is the best device of its type for the PC, but if you're on a tight budget, buy an enhanced joystick first.

The Fully Equipped Cockpit

Barring cost, the ideal flight simulator setup should include a complete re-creation of a cockpit, down to the seat harness and a flight suit. For those of you lucky enough to afford it, you can actually purchase a full replica of a cockpit from ThrustMaster. For those with less ambitious budgets, brackets from Interface Dynamics should suffice. The least that can be done is to use Keyboard Commander Corporation's cleverly designed keyboard templates to reduce the keyboard confusion of the multifunctioned PC flight simulators.

THRUSTMASTER COCKPITS ThrustMaster markets the pieces necessary to assemble the complete structure of a cockpit. With prices starting at $495 for just a small part of the cockpit, these setups are not cheap, but represent the pinnacle to which you can take PC flight simulation at home. The ThrustMaster cockpit kits include the black lineprints for all instrument panels, printed instruction manuals, and suggestions for installing a sound system and provisions for the standard desktop throttle, stick, and rudders.

The minimum ThrustMaster-recommended cockpit configuration (see Figure 13-7) amounts to over $700, and includes the fiberglass outer shell with canopy rails, complete decals for rescue and other information on the outside of the F-16 (modeled after a U.S. Air Force combat jet fighter), and an exact copy of the F-16 throttle quadrant with five detentes for AB stages. Also included in this setup is a microprocessor control module that controls 64 discrete switches located around the cockpit surfaces in the correct positions. These switches operate the landing gears, flaps, and various other equipment. You can optionally obtain an F-16C strain gauge joystick that responds to increasing force and actually moves only ¼ inch in every direction, as used in the real aircraft. For the final touch of realism, you can also purchase lightweight harness belts with quick disconnect fasteners.

Keep in mind that the cockpit is practically a dedicated setup—it is very uncomfortable to use regular programs while seated in the cockpit. Unless

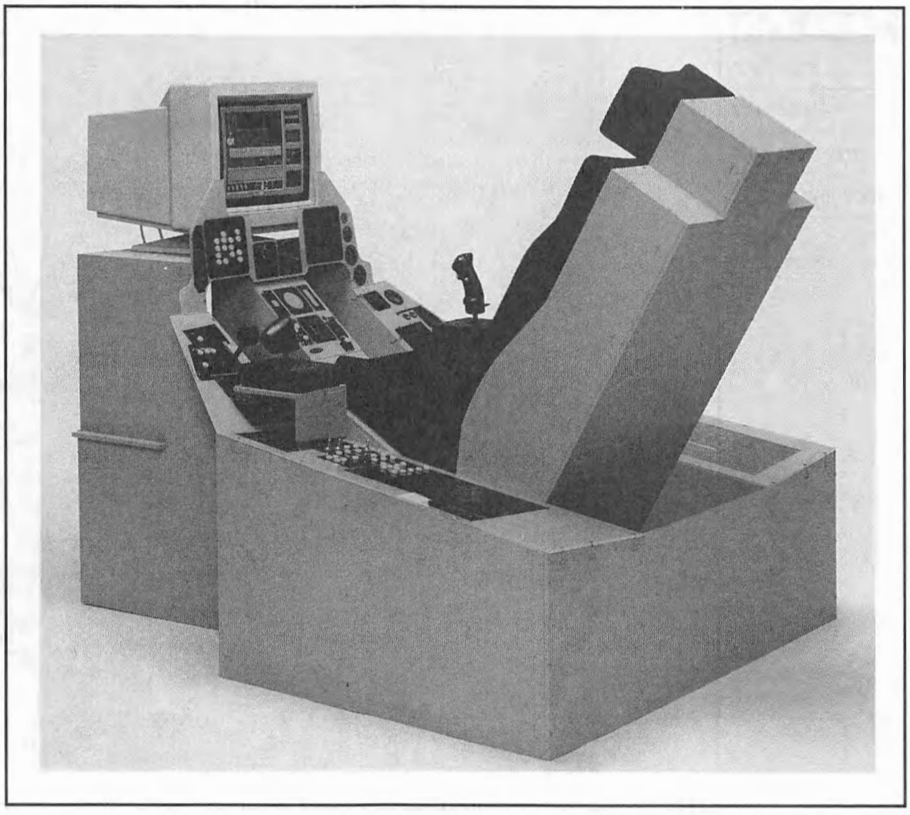


FIGURE 13-7 *The ThrustMaster Cockpit for the truly addicted jet simulator fan*

you plan to move the monitor and other peripherals (such as the keyboard) between flight simulator sessions and real work, you are better off getting another computer for other tasks.

INTERFACE DYNAMICS BRACKETS For those of you who find the ThrustMaster cockpit an expensive proposition not suited to your living conditions, Interface Dynamics may have an alternative. They sell brackets (see Figure 13-8) that securely hold your joystick to your chair. This at least ensures that your joystick stays put while you twist and turn during intense dogfights. An additional bracket could house a Mark II WCS on the left-hand side.

The brackets are highly adjustable and fit most office chairs with arms joined to the seat. Some chairs work better than others; you can obtain a list of compatible chairs from Interface Dynamics. The angle of the platform that holds your joystick is adjustable. Two velcro straps, provided to secure the joystick to the platform, are simple to use and effective. An office chair fully equipped with a ThrustMaster rig (PFCS, Mark II WCS, and RCS) planted on Interface Dynamics brackets is second-best to a full cockpit replica.

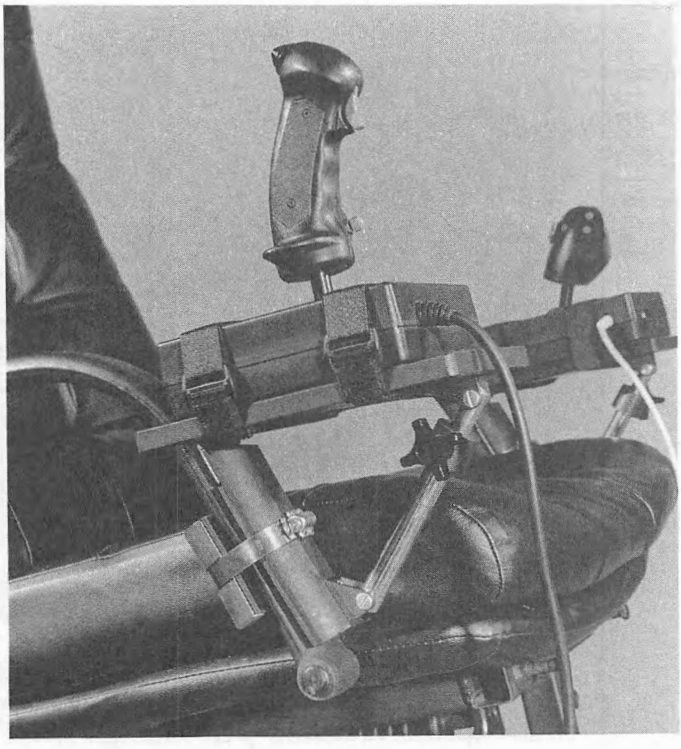


FIGURE 13-8 *Interface Dynamics brackets hold your joysticks in place*

The Interface Dynamics brackets are useful and affordable additions for flight simulator enthusiasts. The price is $99 for a pair or $69 for one.

KEYBOARD COMMANDER CORPORATION KEYBOARD TEMPLATES As flight simulators become more complex and more functions are added, you have to remember more keys to punch when playing the game. It is not unusual for a modern flight simulator to use nearly every key on the keyboard for some function. Unfortunately, unless you spend hours playing one flight simulator, you'll forget some of the required operating keys. Most likely, you use several simulators, all requiring different keystrokes. This is where a keyboard template is useful.

Commander Keyboard Corporation has scored with the best keyboard templates for flight simulators (see Figure 13-9). The templates are full-color and pre-cut to fit on almost any standard 101-key keyboard. Functions such as weapons selection, view control, and radar modes are identically colored and logically placed for quick reference. Legends explaining the various displays such as threat indicators, damage warning panel, and tactical displays are also clearly shown. The template layout is consistent among the different flight simulators, which should help you learn a new game much faster.

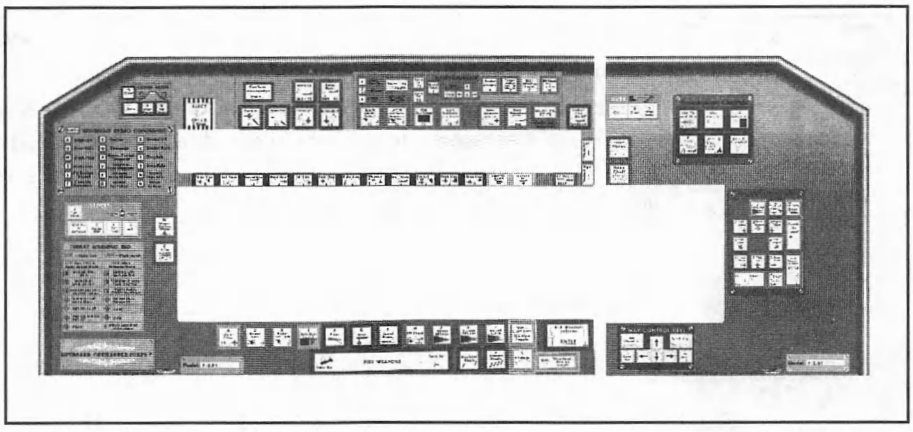


FIGURE 13-9
Keyboard Commander templates may end keyboard confusion

At $12.95, the Commander Keyboard templates are a bargain and a good buy for those who own multiple flight simulators that use a vast number of keys.

For the die-hard Falcon 3.0 pilot, Keyboard Commander also sells separate utility disks for Falcon 3.0/Operation: Fighting Tiger and for the MiG-29 add-on. Falcon Commander Utilities and MiG Commander Utilities are available for $19.95 each, or $24.95 with a keyboard template. The utilities allow you to customize the pilot rosters, create customized missions, calculate fuel consumption, and view Falcon 3.0 screen shots, among the many other features.

Which Simulator Control Should You Buy?

If you don't already have a joystick, the FCS/PFCS is a good initial purchase. If your budget is smaller, spend it on the CH FlightStick, the minimum entry-level joystick for any flight simulator enthusiast. If you purchase either of the above-mentioned, you can easily upgrade your setup by adding a CH Mach Series joystick as a second joystick for throttle and rudder control. If your tastes run towards noncombat flight simulators, the CH Virtual Pilot is unbeatable and is the yoke of choice.

If you already own a joystick and you're contemplating a major upgrade, the Mark II WCS is a wise purchase. This device allows a hands-off-the-keyboard approach and eliminates the finger gymnastics you have to perform when playing any of the PC flight simulators. The RCS is the icing on the cake and can be added to complete your flight controls setup.

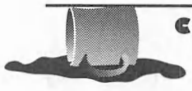


NOTE: *If you have problems with calibrating your joystick or using your joystick in any program when it is plugged into the Pro Audio joystick port, and you have a 33MHz 486-or-faster computer, it is very likely that you have to purchase a faster game card as described later in this chapter. In this case, a speed-compensating joystick card (discussed later in this chapter) should be at the top of your shopping list prior to purchasing other controllers such as the Mark II WCS or RCS.*

CONTROL PADS FOR ARCADE AND ACTION GAMES

Frustrated is a word that describes many of us who have tried playing action-oriented or sports games on the PC with a regular joystick. It seems like all the precision joysticks designed for the PC do wonderfully well for flight simulators and such, but are woeful for arcade-type games that require quick directional control instead of precise movements. Arcade-type games on the PC, such as Apogee's Wolfenstein 3D, Brøderbund's Prince of Persia or SSI's Flashback, require fast action for directional changes. For this type of game, the Nintendo-style *control pad* is preferable because it allows you to make the directional changes faster than you could using a regular joystick. The same control pads work equally well with many sports games like Front Page Sports Football and Accolade's Hardball III (a baseball game) by Dynamix.

Advanced Gravis and Suncom offer the only two digital game pad controllers for the PC. Either one is widely available and works with the Pro Audio joystick port.



CAUTION: *Control pads are not suited for games such as flight simulators. The digital control pad does not work well at all with most simulators—it's like trying to drive a car with a steering wheel that will only turn 90 degrees left or right and nothing else. Digital control in the form of a control pad does not allow in-between readings, only absolute readings in the eight directions: up, down, left, right, up-left, up-right, down-left, and down-right.*

Advanced Gravis PC GamePad ($29.95)

The Advanced Gravis PC GamePad (see Figure 13-10) makes many arcade and sports games a lot easier to play. You get a good, solid feel from its control pad and positive feedback from its buttons. The GamePad comes



FIGURE 13-10
The Advanced Gravis PC GamePad can be operated by left- or right- handers

with a handle that can be screwed onto the center of the pad for those who prefer a joystick feel.

The GamePad features four color-coded buttons. Two of these mimic the buttons (A and B) found on other joysticks. The two remaining buttons function either as additional single-shot buttons or turbo-fire buttons (which simulate quickly repeated button presses), depending on a switch setting on the side of the GamePad. A thoughtful second switch allows the GamePad to operate either as a right- or left-handed controller.

At its modest asking price, the GamePad is invaluable for those who play a lot of action games. The extra buttons on the GamePad are currently supported by Wolfenstein 3D and Flashback, allowing you to play these games without resorting to the keyboard for certain actions. This not only speeds up gameplay but also increases the responsiveness of the onscreen character. The extra speed allows you to handle difficult parts of the games, using movements that would otherwise be difficult to execute with a regular joystick. The Game Pad should substantially increase your hitting ability in baseball games like Hardball III, and it should have similarly positive effects when used with other sports games such as Front Page Sports Football.

Playing an action game using the keyboard, mouse, or analog joystick is like trying to shoot a fly with an elephant gun. The PC GamePad is the controller of choice for fast action and many sports games.

Suncom Command Control ($19.95)

Suncom's Command Control is another control pad (see Figure 13-11) along the lines of the Gravis GamePad. It is the larger of the two but does not offer all the facilities of the GamePad. Command Control is cheaper, however, and works well with the action games we tried. The Command Control has five fixed-function buttons: the two joystick buttons A and B, two turbo-fire buttons, and a turbo-fire button that simulates pressing buttons A and B at the same time. Unfortunately, a left/right-handed switch is absent, making the Command Control useless for left handers.

The feel of Command Control is mushy compared to the GamePad—we prefer the GamePad. However, the "feel" of any game controller is highly subjective, and you may well prefer Command Control. Its unique shape fits medium- and larger-sized hands; smaller hands may have slight problems with the grip.

Overall, Command Control works well for those who are used to or who prefer the feel of the actual Nintendo controllers. It would be a shame not to have one of these economical game pads if you play any action or sports games at all.

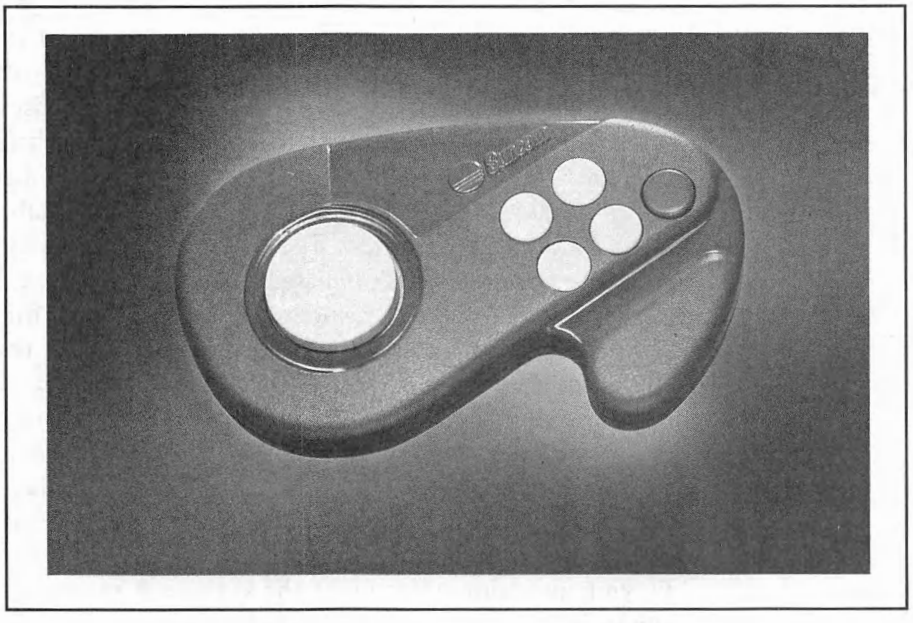


FIGURE 13-11

The affordable Suncom Command Control works well with fast arcade-type games

Advanced Applications of Controllers

Besides games, controllers of all sorts are used for a variety of other more serious applications. Some of the advanced applications of this technology are fascinating to say the least. You'll find that virtual reality and multimedia industries have found some innovative uses for something as ordinary as a joystick. The Highway Patrol and State Police use cockpits to train new officers on high-speed chases in an urban environment. Architects provide clients with walkarounds in new buildings that have not yet been built, using a computer-generated virtual reality environment and controllers to adjust positioning. Joysticks are used extensively in medicine—just witness the ones on motorized wheelchairs. Pilots can practice instrument flying with a variety of software and controller combinations to either brush up their skills or to prepare for an exam. Even movies are made with the help of many advanced and complicated controllers. In Jurassic Park, *special effects maestros used many controllers and joysticks to manipulate and move the huge life-size models of dinosaurs. And you certainly won't find a real jet fighter pilot who doesn't use a joystick to fly his jet.*

CONTROLS FOR THE FUTURE

As virtual reality and advanced gaming applications become mainstream, the number of accessories that hook up to your PC will increase. The current joystick port on your Pro Audio sound card is inadequate because it can handle no more than two joysticks with two buttons each. Clearly a superior interface has to be designed to allow accessories such as helmets, gloves, body suits, and other advanced controls to connect to the PC. The EPIC add-on game controller is the first—and currently only—equipment that promises to deliver just that.

R&R Electronics EPIC ($389)

The Extended/Programmable Input Controller (EPIC) consists of a card that goes in your PC (which works in place of the Pro Audio joystick port). EPIC is fully user-programmable and provides support for up to 8 joysticks and 128 buttons. For the more technically inclined, EPIC specifically features:

- Customizable progressive rates for primary (first 2) joysticks.
- Joystick and button mapping—any analog channel can be mapped to any joystick axis; any button can be mapped to any joystick button or keyboard key.
- Extensive button programming—any button state transition (press or release) can be mapped to any function consisting of key presses, delays, and/or flag changes.

The EPIC plugs into a slot in your PC and acts just like a standard joystick card, but it also plugs into your PC's keyboard port, like the Mark II WCS in this regard. Your keyboard, joystick, throttle, rudder pedals, and others plug into a "breakout box" connected to the EPIC controller via a ribbon cable. Even in this configuration, all your programs recognize the EPIC controller as a joystick controller and treat it as such, and your keyboard works normally.

The change comes when you download a special file (before running your game) to the EPIC that reprograms your joysticks and buttons. Once initialized, the EPIC controller interprets your joystick, throttle, and buttons as defined by this special file. Because the EPIC offers increased functionality over the Mark II WCS, it is not surprising that the programming is complicated—you need to have at least some minimal programming experience. However, configuration files for the more popular flight simulators are included.

The exciting news about EPIC is the ability to attach more than two control devices to the PC. Future controls that can be connected to the EPIC could include a helicopter throttle/collective, automobile steering wheel with gear shift and gas, brake and clutch pedals, throttle quadrants for multi-engined aircraft, and throttle quadrants with throttle, mixture, and propeller controls.

QUICK JOYSTICK TROUBLE-SHOOTING

The most common problem with the joystick port on the Pro Audio sound card is that it may conflict with one already on your computer. Most computers are sold with a multi-I/O card that not only includes serial and parallel printer ports but also a joystick port (otherwise known as a game

port). When you activate your Pro Audio's joystick port, a conflict occurs, inevitably preventing either joystick port from working.

You can do one of two things if you run into this problem. You can disable the joystick port on your multi-I/O card by referring to its manual, or disable the one on the Pro Audio. The former may involve removing jumpers on the multi-I/O card, which means you have to get into your machine. The easier route is to disable the Pro Audio joystick port via a software switch and use the one on the multi-I/O.

The joystick port on the Pro Audio can be disabled by adding the J:0 parameter to the MVSOUND.SYS command in your CONFIG.SYS file. For example:

```
DEVICE = C:\PAS\MVSOUND.SYS D:3 Q:7 S:1,220,1,5 M:0 J:0
```

To enable the Pro Audio joystick port, you need to add J:1 to the MVSOUND.SYS command. For example:

```
DEVICE = C:\PAS\MVSOUND.SYS D:3 Q:7 S:1,220,1,5 M:0 J:1
```

If you're still having problems after making sure you only have one joystick port active in your system, check the obvious and make sure you have the joystick connected to the correct joystick port. If problems persist, and you have a fast computer, it could be that the your computer is too fast for the standard joystick port found on all Pro Audio sound cards. You need a speed-compensating joystick card if that is the case.

Speed-Compensating Joystick Cards

The joystick port on the Pro Audio is essentially the same one that was designed when the fastest computers around were 8MHz 286 IBM AT computers. Today's computers are many times faster than that, causing all sorts of conflicts with the old slower joystick port design. Some of the many problems you may encounter include the inability to properly calibrate the joystick for a game, joystick drifting (not centering correctly) after calibration, or joystick buttons not responding when pressed. Many times, these problems are wrongly attributed to a malfunctioning joystick.

If you're experiencing any of the joystick problems described above, you probably need to disable the joystick port on the Pro Audio sound card and use a speed-compensating joystick card like the Advanced Gravis Eliminator, CH GameCard III, or ThrustMaster ACM card. These speed-compensating game cards are designed to work correctly with fast computers. The list prices for the cards are in the $50 range.

The CH GameCard III is actually designed to work with computers that operate as fast as 80MHz. A program in your AUTOEXEC.BAT file initializes the GameCard III but does not take up any memory once it initializes the card. The Gravis Eliminator game card works with computers as fast as a 66MHz 486. It comes with an external speed-compensation knob, which allows you to adjust the setting easily at any time. The ThrustMaster ACM card uses the latest design in game cards and incorporates components that are up to military specifications in its circuits. It is arguably the best speed-compensating game port available for the PC.

All of the above-mentioned high-speed joystick cards work as advertised and should be considered if you're having problems with the Pro Audio joystick port on your fast computer.

SOURCES

The following is a list of the companies whose products we got to look at and play with:

Advanced Gravis
#101-3750 North Fraser Way
Burnaby, BC, Canada
(800) 663-8558
(604) 431-5155 (Fax)

CH Products
970 Park Center Drive
Vista, CA 92083
(619) 598-2518
(619) 598-2524 (Fax)

Interface Dynamics
P.O. Box 858
Wolfeboro, NH 03894
(603) 569-4638

Keyboard Commander Corporation
4839 SW 148 Avenue, #402
Davie, FL 33330
(800) 262-6066

Suncom
6400 W. Gross Point Road
Niles, IL 60714
(708) 647-4040
(708) 647-7828 (Fax)

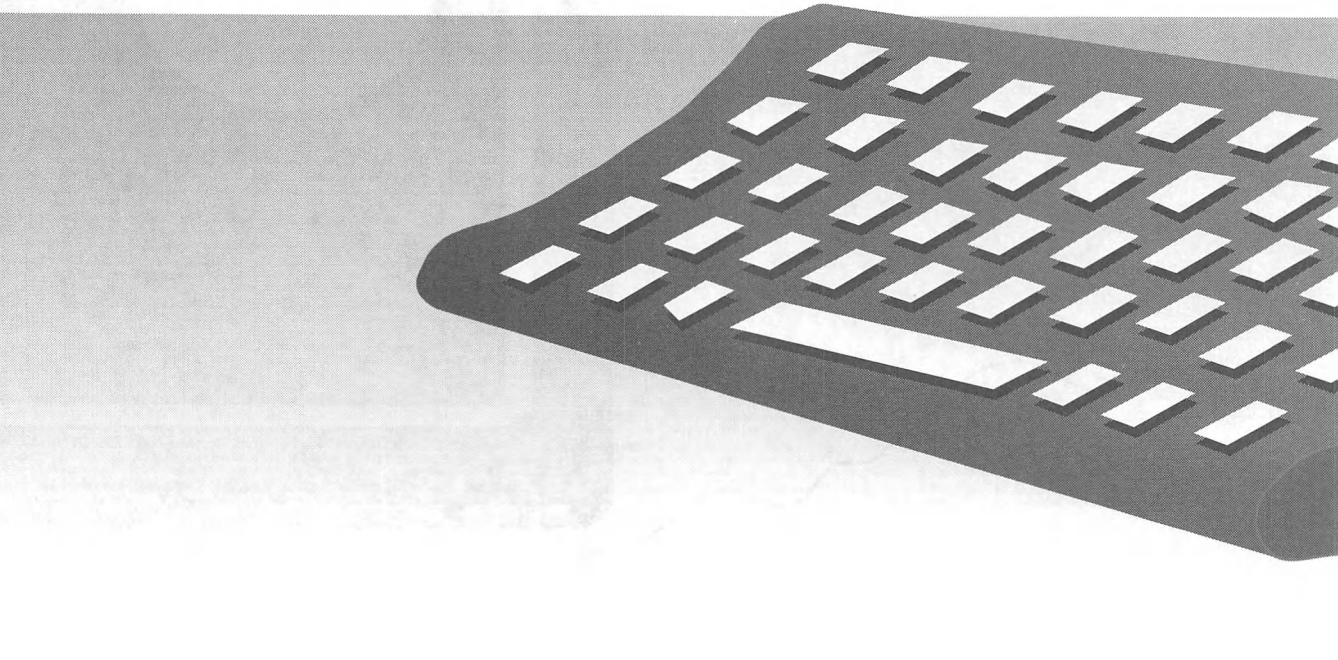
R&R Electronics (EPIC)
4009 Parkwood Street
Brentwood, MD 20722

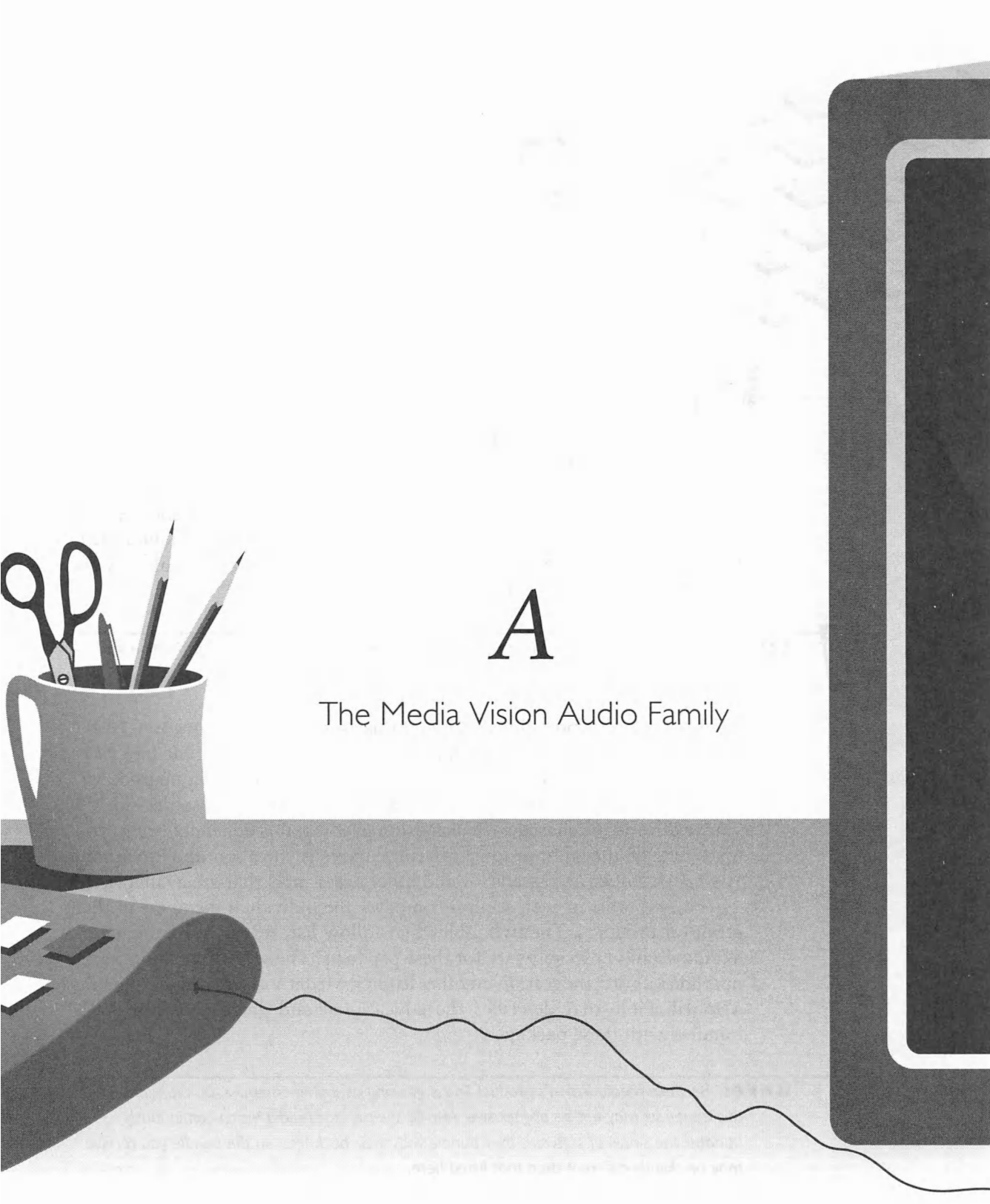
ThrustMaster
10150 SW Nimbus Ave., Suite E-7
Tigard, OR 97223
(503) 639-3200
(503) 620-8094 (Fax)

V

Appendixes

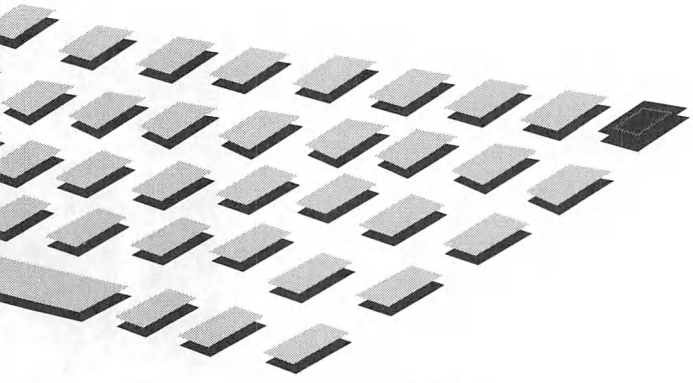






A

The Media Vision Audio Family



THIS appendix outlines what's available in Media Vision's rapidly growing family of sound cards, multimedia kits, and self-contained sound systems, with an emphasis on the most popular packages. The *multimedia upgrade kits* include a sound card, a CD-ROM drive, and inexpensive speakers. The *sound systems* contain the same electronics as a sound card, but it's found in a circuit board placed inside a stand-alone unit along with a CD-ROM drive, speakers, and a microphone.



TIP: *You can access Media Vision's automated response system to receive information on Media Vision products by fax or mail. The number is (800) 846-5870.*

This appendix provides feature comparison tables by category: 16-bit sound cards, 16-bit multimedia upgrade kits, and other leading Media Vision products. If you're looking to buy a sound card or multimedia upgrade kit, this appendix will be invaluable in making the best purchase decision. If you've already purchased a Media Vision product, this appendix brings you up to date on the latest product offerings and tells you about the Pro Studio PowerPak software upgrade kit and other accessories that are available.

The first table in each section compares the individual members in that group of products. The two tables that follow list, respectively, the major Windows and DOS software for these products. The section on multimedia upgrade kits and the section on other leading Media Vision products contain a fourth table that describes the educational and game software that's bundled with these packages.



NOTE: *Because Media Vision's product line is growing at a phenomenal rate, the tables in this appendix may not be all-inclusive. Also be aware that Media Vision continuously updates the suites of software they bundle with their packages, so the bundle you receive may be slightly different than that listed here.*

PURCHASING MEDIA VISION PRODUCTS

Media Vision sells its product through computer retailers and mass merchandisers as well as direct to the customer. Certain specialty items such as the Pro Studio PowerPak, a software upgrade (described in this appendix), must be bought directly from Media Vision.

Selecting a Reseller

Computer dealers with retail storefronts may charge more than mail order sources but they can provide valuable assistance in installation and troubleshooting. In addition, a salesperson you meet face-to-fact may agree to exchange or replace a product that doesn't match your needs, which may not be possible with a mail order purchase.

It's most beneficial to go to a retail dealer when buying a complete multimedia system such as the new Memphis. You take your computer to the dealer for the sound card installation. Once the dealer has installed the new sound card, you can bring your computer home and plug in Memphis, and you'll be up and running with no more effort than it takes to set up a stereo system.

Buying Direct from Media Vision Resources

If you're shopping for the best price or a special bargain, you should give *Media Vision Resources* a call. Media Vision Resource is the end-user customer sales line. It is a toll-free call at (800) 684-6699. Overseas callers should dial Media Vision's main phone number at (510) 770-8600 and ask for Media Vision Resources.

Getting a Bargain

Media Vision doesn't advertise the fact that their direct sales line will sell more than just upgrades directly to you. You can buy sound cards, multimedia kits, and even complete multimedia systems directly from Media Vision. For example, the Fusion CD 16 and Pro 16 Multimedia System are very capable products but are now "last year's models" because Media Vision has released the Fusion DoubleCD 16 and Pro 16 Multimedia System

II. A Fusion CD 16, which has a manufacturer's suggested list price of $699, can be bought through Media Vision Resources for just $399. For another bargain, you can buy a Pro 16 Multimedia System which lists for $1049 for just $599.

Media Vision's latest products, including the Pro AudioStudio 16 and 16XL, the Pro 16 Multimedia System II, and Memphis are not sold through Media Vision Resources. You can buy a Pro AudioSpectrum 16 and most other products, at a discount, direct from Media Vision.

POPULAR MEDIA VISION PRODUCTS

The key table of this appendix, Table A-1, lists Media Vision's products by category: audiophile sound card, multipurpose 16-bit sound card, multimedia upgrade kit, and the Pro Studio PowerPak, a software and microphone bundle.

The first multimedia upgrade kit listed above, the Fusion CD 16, is the least expensive. The Fusion DoubleCD 16 is more expensive because it

Product Category	Products in This Category
Audiophile Sound Card	Pro AudioStudio 16XL (Pro AudioStudio 16 with Korg wavetable synthesis).
Multipurpose 16-bit Sound Card	Pro AudioStudio 16, Pro AudioSpectrum 16, Pro Audio 16 Basic.
Multimedia Upgrade Kit	Sound card and CD-ROM bundle, Fusion.
	CD 16 and Fusion CD 16E (includes Pro AudioSpectrum 16 and standard CD-ROM).
	Fusion DoubleCD 16 and Fusion DoubleCD 16E (includes Pro AudioStudio 16 and double-speed CD-ROM).
	Pro 16 Multimedia System II (includes Pro AudioStudio 16 and double-speed CD-ROM).
Pro Studio PowerPak	Software and microphone only. This upgrade kit is designed for owners of the Pro AudioSpectrum 16 who wish to purchase the software bundled with the Pro AudioStudio 16. This includes the following Windows programs: Sound Impressions, Monologue 16, and ExecuVoice. You can buy this direct from Media Vision for $59 plus shipping and tax. The Media Vision Resource phone line for end-user sales is (800) 684-6699.

TABLE A-1 *The Most Popular Media Vision Products* ■

contains a faster CD-ROM (the double-speed drive) and the newer, refined Pro AudioStudio 16 sound card. The Pro 16 Multimedia System II is another step up, having an even faster double-speed CD-ROM drive. It also includes a larger collection of software.

MEDIA VISION'S MOST POPULAR 16-BIT SOUND CARDS

Media Vision's Pro Audio 16 family consists of four cards. The two that reflect the latest enhancements in circuit design, and which are bundled with the most software, are called Pro AudioStudio 16 and Pro AudioStudio 16XL. The original 16-bit card, Pro AudioSpectrum 16, is accompanied by a less expensive version called Pro AudioSpectrum 16 Basic.

Pro AudioSpectrum 16

Pro AudioSpectrum 16 is the best selling 16-bit sound card in the market as this book goes to press. Its strengths include a low-noise analog mixer, an industry-standard SCSI port, a MIDI port, and PCM circuitry that can take as many as 44,100 16-bit samples per second, providing CD-ROM-quality recording.

Pro AudioSpectrum 16's MIDI capability was upgraded in April of 1993 (simultaneous to the introduction of the Pro AudioStudio 16) to emulate the Roland MPU-401 MIDI interface.

Pro AudioStudio 16

The newest addition to Media Vision's line of sound cards is the Pro AudioStudio 16. It is essentially a refinement of Pro AudioSpectrum 16. These refinements, making it the preferred card for serious audio enthusiasts, are

- Better shielding for lower noise
- Line-out output that delivers a low-distortion signal to an external stereo amplifier
- Roland MPU-401 emulation ensuring compatibility with professional-caliber music software

Pro AudioStudio 16 is now included in the latest version of the Fusion DoubleCD 16 and Pro 16 Multimedia System II.

Pro AudioStudio 16XL

The 16XL version of Pro AudioStudio 16 turns your PC into a professional-caliber music studio. The 16XL adds a Korg wavetable synthesis daughterboard with 32 voices onto the Pro AudioStudio 16. A wavetable synthesizer contains digital samples of actual instruments that sound truly realistic, much better than the sound from an FM synthesizer. The Korg synthesizer, which has built-in reverb (reverberation) and chorus effects, is the same synthesizer found in Korg's own professional audio workstations. The software bundle with the 16XL is the same as the Pro AudioStudio 16, except that a different MIDI sequencer is provided—Passport Design's Trax (with Notation) substitutes for Midisoft's Recording Session.

Pro Audio 16 Basic

The "basic" version of the Pro AudioSpectrum 16 is the same card as the standard Pro AudioSpectrum 16, except that the SCSI CD-ROM interface has been removed. Only the most essential software programs are included. The Pro AudioSpectrum 16 Basic is designed for those users who already have all the software they need, or who prefer the most economical 16-bit system. Monologue and Recording Session, included with the Pro AudioSpectrum 16, are not included with the Pro AudioSpectrum 16 Basic. Dinosaur Adventure, from Knowledge Adventure, comes with the Basic version only.



NOTE: *A CD-ROM can be added to a multimedia system built around the Pro Audio 16 Basic by adding a third party SCSI interface card. The cost of the Basic plus SCSI card will be significantly more than the purchase cost of a Pro AudioSpectrum 16 with the built-in SCSI interface. See Chapter 11 and Appendix C for more details on CD-ROM and SCSI, respectively.*

TYPES OF SOUND AND MUSIC SOFTWARE

The comparison tables for Media Vision sound cards, multimedia upgrade kits, and integrated multimedia systems that follow in this appendix

list the suite of sound and music software that's provided by Media Vision with each product. The software packages are organized into the following categories:

Software Category	Description of Software Category
Mixer Control	Controls the master volume level and the relative volume of the sources.
Music Studio	Plays music files and includes a visual display of the music as it is performed.
Recording Software	Records, edits, and plays back digital audio sound. Includes tools for special effects such as echoes and fades.
MIDI Sequencer	Records, edits, and plays back MIDI music files. Can be used with just the internal FM synthesizer or to control an entire MIDI network.
CD Player Program	Plays audio CDs in your computer's CD-ROM player.
Text-to-Speech Synthesizer	Speaks to you while reading the contents of a document or spreadsheet. The Windows version reads from the Windows clipboard.
Speech Recognition	Responds to commands spoken into a microphone, executing commands such as "File Open."
Pocket Tools	Includes easy-to-use tools for the Microsoft Windows environment: Pocket Mixer, Pocket Recorder, and Pocket Player. Pocket Tools make it easy to manipulate all types of sound in your system, including microphone, external stereo, digital audio, and FM-synthesized music.
Command-Line Utilities	Includes DOS utility programs designed for very specific tasks, executed from the DOS command prompt.

Most of the software programs cited in the tables are described in this book, often in considerable detail. A few programs, which are no longer shipped by Media Vision and are not essential for enjoyment of the sound card, are not described here.

A COMPARISON OF MEDIA VISION'S 16-BIT CARDS

Table A-2 lists the features that distinguish Media Vision's most popular 16-bit sound cards. Table A-3 lists the Windows programs bundled with the 16-bit sound cards. Table A-4 lists the DOS programs bundled with these same cards.

	Pro Audio Studio 16/16XL	Pro Audio Spectrum 16	Pro Audio 16 Basic
Wavetable Synthesizer	Yes (16XL)	No	No
FM Synthesizer	Yes	Yes	Yes
Stereo Output	Yes	Yes	Yes
Digital Audio Bits	16	16	16
CD-ROM Drive	Not included	Not included	Not available
CD-ROM Interface	SCSI	SCSI	None
Extensive Choice of DMA/IRQ Settings	Yes	Yes	Yes
MPU-401 Emulation	Yes	Yes	Yes
Sound Blaster-Compatible	Yes	Yes	Yes
Hardware Accessories	Microphone	None	None
List Price	$349	$299	$199

TABLE A-2 *Media Vision's Most Popular 16-Bit Sound Cards* ■

	Pro Audio Studio 16/16XL	Pro Audio Spectrum 16	Pro Audio Spectrum 16 Basic
Mixer Control	Pro Mixer	Pro Mixer	Pro Mixer
Recording	Sound Impressions	Pocket Recorder	Pocket Recorder
MIDI Sequencer	Recording Session (16) Trax with Notation (16XL)	Recording Session	None
Text-to-Speech Synthesizer	Monologue 16 for Windows	None	None
Speech Recognition	ExecuVoice	None	None
Pocket Tools	Pocket Mixer, Pocket Recorder, Pocket CD	Pocket Mixer, Pocket Recorder, Pocket CD	Pocket Mixer, Pocket Recorder, Pocket CD

TABLE A-3 *Windows Software Bundled with the 16-Bit Sound Cards* ■

	Pro Audio Studio 16/16XL	Pro Audio Spectrum 16	Pro Audio Spectrum 16 Basic
Mixer Control	PAS Mixer	PAS Mixer	PAS Mixer
Music Studio	TrackBlaster Pro	TrackBlaster Pro	TrackBlaster Pro
Command-Line Utilities	Playfile and Recfile	Playfile and Recfile	Playfile and Recfile
CD Player Program	None	Musicbox	None
Text-to-Speech Synthesizer	None	Monologue	None

TABLE A-4 *DOS Software Bundled with the 16-Bit Sound Cards* ■

COMPARISON OF MEDIA VISION'S 16-BIT MULTIMEDIA UPGRADE KITS

TABLE A-5 lists the features that distinguish the most popular 16-bit multimedia upgrade kits.

The Labtec speakers work well with or without power. You can power them by purchasing batteries or an inexpensive 6-volt DC power supply. The Labtec speakers are shielded, so you can position them safely next to your monitor. See Chapter 12 for more details on loudspeakers.

Table A-6 lists the Windows programs that are bundled with these kits, and Table A-7 lists the DOS programs that are bundled for these same kits. Table A-8 lists the game, educational, and reference software bundled, most of which are CD-ROM titles.



NOTE: *The software bundled with these kits changes continuously, so don't be surprised when you open your package, compare it against the list in the book, and discover a few differences.*

	Fusion CD 16 and CD 16E*	Fusion Double CD 16 and CD 16E*	Pro 16 Multimedia System II
Sound Card Model	Pro Audio Spectrum 16	Pro Audio Studio 16	Pro Audio Studio 16
Stereo Output	Yes	Yes	Yes
Digital Audio Bits	16	16	16
CD-ROM Drive	CD 16: Sony CD 16E: NEC 25BJ Standard Speed	NEC 55JD Double Speed	NEC 84-1 Multi Speed
CD-ROM Interface	CD 16: Proprietary CD 16E: SCSI	SCSI	SCSI
Extensive Choice of DMA/IRQ Settings	Yes	Yes	Yes
MPU-401 Emulation	Yes	Yes	Yes
Sound Blaster-Compatible	Yes	Yes	Yes
Hardware Accessories	Labtec Powered Speakers	Labtec Powered Speakers	Labtec Powered Speakers
List Price	CD 16: Proprietary $699 CD 16E: SCSI $699	CD 16: Proprietary $899 CD 16E: SCSI $999	$1195

*The CD 16E has an external CD-ROM drive while the CD 16 is internally mounted.

TABLE A-5 *Media Vision's Most Popular 16-Bit Multimedia Upgrade Kits* ■

	Fusion CD 16 and CD 16E	Fusion Double CD 16 and CD 16E	Pro 16 Multimedia System II
Mixer Control	Pro Mixer	Pro Mixer	Pro Mixer
Recording Software	Pocket Recorder	Pocket Recorder	Sound Impressions
MIDI Sequencer	None	None	Recording Session
Text-to-Speech Synthesizer	None	None	Monologue 16 for Windows
Speech Recognition	None	None	ExecuVoice
Pocket Tools	Pocket Mixer, Pocket Recorder, Pocket CD	Pocket Mixer, Pocket Recorder, Pocket CD	Pocket Mixer, Pocket Recorder, Pocket CD

TABLE A-6 *Windows Software Bundled with the 16-Bit Multimedia Upgrade Kits* ■

	Fusion CD 16 and CD 16E	Fusion Double CD 16 and CD 16 E	Pro 16 Multimedia System II
Mixer Control	PAS Mixer	PAS Mixer	PAS Mixer
Command-Line Utilities	Playfile and Recfile	Playfile and Recfile	Playfile and Recfile
Recording Software	None	None	None
CD Player Program	Musicbox	Musicbox	Musicbox
Text-to-Speech Synthesizer	None	None	None

TABLE A-7 *DOS Software Bundled with the 16-Bit Multimedia Upgrade Kits* ■

	Fusion CD 16 and CD 16E	Fusion Double CD 16 CD 16E	Pro 16 Multimedia System II*
Educational	Where is Carmen Sandiego? (Deluxe Edition) (DOS)	Where is Carmen Sandiego? (Deluxe Edition) (DOS) Arthur's Teacher Trouble by Brøderbund (Windows)	Where is Carmen Sandiego? (Deluxe Edition) (DOS)
Reference	Compton's Interactive Encyclopedia (Windows)	Compton's Interactive Encyclopedia (Windows)	Compton's Interactive Encyclopedia (Windows) Mayo Clinic Health Book (Windows)
Entertainment	Battle Chess by Interplay (DOS and Windows)	Battle Chess by Interplay (DOS and Windows) The 7th Guest by Virgin Games (DOS)	Battle Chess by Interplay (DOS and Windows)
	Mantis Experimental Fighter & Civilization by MicroProse (DOS)		Mantis Experimental Fighter & Civilization by MicroProse (DOS) PC Karaoke (Windows)
Presentation	None	None	Macromedia Action! by Macromind (Windows)

*The first version of this kit included Lotus 1-2-3 with Multimedia Smart Help, King's Quest V by Sierra On-line, Nautilus Multimedia Magazine, and Action! by MacroMind.

TABLE A-8 *Other Software Bundled with the 16-Bit Multimedia Upgrade Kits* ■

COMPARISON OF OTHER MEDIA VISION PRODUCTS

Table A-9 lists the features that characterize Media Vision's other leading audio products. Some of these products, such as Thunder Board and Audio Port, contain the older 8-bit digital audio technology.

Please note that Thunder Board comes in two distinct packages. One is for DOS use only and the other is for both DOS and Windows. The Windows software listed for Thunder Board is found only in the Windows version of the package.

	CDPC/ CDPC XL	Thunder & Lightning	Thunder Board	Audio Port
Stereo Output	Yes	No	No	No
Digital Audio Bits	16	8	8	8
CD-ROM Drive	CDPC: Standard-speed CDPC XL: Double-soeed	Not included	Not included	Not included
CD-ROM Interface	SCSI	None	None	None
Extensive Choice of DMA/IRQ Settings	Yes	No	No	No
MPU-401 Emulation	No	Yes	No	No
Integrated VGA	No	Yes (24-bit)	No	No
Sound Blaster-Compatible	Yes	Yes	Yes	Yes
Hardware Accessories	Integrated system including 100-watt power amp, speakers, and microphone	Only audio card that has integrated Super VGA graphics	None	Battery-powered portable sound unit that attaches to a parallel port; requires Windows 3.1
List Price	$1495	$349	$179	$199

TABLE A-9 *Other Leading Audio Products by Media Vision* ■

The CDPC and CDPC XL are completely integrated multimedia systems. Everything is contained in a sleek-looking cabinet less than four inches high. You can mount the cabinet on top of a PC, and then place the monitor on top of the cabinet. The cabinet contains a Pro AudioSpectrum 16-equivalent circuit board, a CD-ROM drive, a built-in microphone, and a carefully crafted speaker system. The speaker system includes a 100-watt power amplifier that easily powers two 20-watt side speakers and an optional Bass enhancement system. The cabinet is connected to your PC through a proprietary interface card that plugs into the PC. The CDPC contains a standard CD-ROM drive, while the CDPC XL contains a double-speed drive for higher performance. The same system can be attached to a Macintosh computer by buying the equivalent Macintosh interface card.

Two products described in this section are slightly unusual. Thunder & Lightning is a combination sound card and Super VGA video card. The circuitry and features of the sound part of Thunder & Lightning are a blend of Thunder Board and 24-bit SVGA card. The other unusual product is the portable, battery-powered Audio Port, which has a built-in speaker. It can also drive an external speaker.

Table A-10 lists the major Windows programs bundled with these audio products, and Table A-11 lists the major DOS programs that are bundled with these packages. Table A-12 lists the games, educational, and reference software bundled, many of which are CD-ROM titles.

	CDPC/ CDPC XL	Thunder & Lightning	Thunder Board	Audio Port
Mixer Control	Pro Mixer	Pro Mixer	Pro Mixer	Pro Mixer
Recording Software	Pocket Recorder	Pocket Recorder	Sound Forge for Windows	Pocket Recorder
MIDI Sequencer	None	Recording Session	None	None
Text-to-Speech Synthesizer	None	Monologue 16 for Windows	Monologue 16 for Windows	None
Speech Recognition	None	None	None	None
Pocket Tools	Pocket Mixer, Pocket Recorder, Pocket CD	Pocket Mixer, Pocket Recorder, Pocket CD	Pocket Mixer, Pocket Recorder, Pocket CD	Pocket Mixer, Pocket Recorder, Pocket CD

TABLE A-10 *Windows Software Bundled with Other Leading Audio Products* ■

	CDPC/ CDPC XL	Thunder & Lightning	Thunder Board	Audio Port
Mixer Control	PAS Mixer	PAS Mixer	PAS Mixer	PAS Mixer
Music Studio	TrackBlaster Pro	Master Tracks Pro Demo	None	None
Recording Software	None	None	None	None
MIDI Sequencer	None	Midi Sequencer by Passport	None	None
CD Player Program	None	None	None	None
Text-to-Speech Synthesizer	None	None	None	None
Command-Line Utilities	Playfile and Recfile	Playfile and Recfile	Playfile and Recfile	Playfile and Recfile

TABLE A-11 *DOS Software Bundled with Other Leading Audio Products* ■

Pro AudioSpectrum

Pro AudioSpectrum is the original Media Vision sound card. It has 8-bit digital audio and a 22-voice FM synthesizer. The CD-ROM port is not a standard SCSI interface. This sound card emulates an Ad Lib sound card but

	CDPC/ CDPC XL	Thunder & Lightning	Thunder Board	Audio Port
Educational/ Reference	Action! by Macromind (Windows) Multimedia Encyclopedia by Comptons (Windows)	Talking Calendar (Windows) Lotus Sound (Windows) Midi Sound Clips	Talking Calendar (Windows) Lotus Sound (Windows)	Talking Calendar (Windows)
Games	Where is Carmen Sandiego? by Brøderbund (Deluxe Edition) (DOS)	None	Game Samplers (DOS)	None

TABLE A-12 *Other Software Bundled with Other Leading Audio Products* ■

not the Sound Blaster. The Pro AudioSpectrum 16 and the newer 16-bit sound cards emulate the Sound Blaster, so you can be confident that these cards will work with your game software. However, only AdLib-compatible games are sure to work on the original Pro AudioSpectrum. Before buying a game, check the packaging to see if it claims compatibility with Pro AudioSpectrum (distinct from Pro AudioSpectrum 16). Pro AudioSpectrum is no longer sold by itself.

Fusion CD

The Fusion CD multimedia upgrade kit includes the original Pro AudioSpectrum Plus 8-bit card and a standard (low-speed) CD-ROM drive. This is Media Vision's most inexpensive multimedia upgrade kit. You may still find it available for sale but you're better off buying the more modern Fusion CD 16 kit.

Pro AudioSpectrum Plus

This sound card is identical to the Pro AudioSpectrum 16 except that the digital audio is 8-bit instead of 16-bit. You may find this product on the store shelf, but it's no longer manufactured by Media Vision. This card is less expensive than a Pro AudioSpectrum 16, but it's not the best value for your dollar.

Pro 16 Multimedia System

Pro 16 Multimedia System is the first multimedia upgrade kit to include the Pro AudioSpectrum 16 sound card. It includes an NEC double-speed drive, Lotus 1-2-3, and a variety of software goodies on CD-ROM. It's been superseded by the Pro 16 Multimedia System II, the new top-of-the-line multimedia upgrade kit.

RELATED PRODUCTS

This appendix concludes by mentioning Media Vision products that don't fall neatly into the major categories or fall outside the scope of this book.

Accesories

The MIDI Mate connector box, which provides an interface to MIDI music instruments, is described in Chapter 8.

Macintosh Media Vision Audio Products

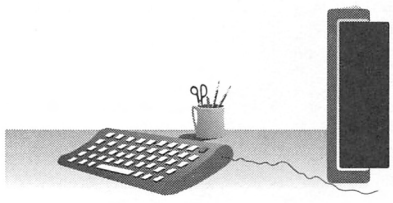
Media Vision sells several audio products for the Apple Macintosh. These products are outside the scope of this book.

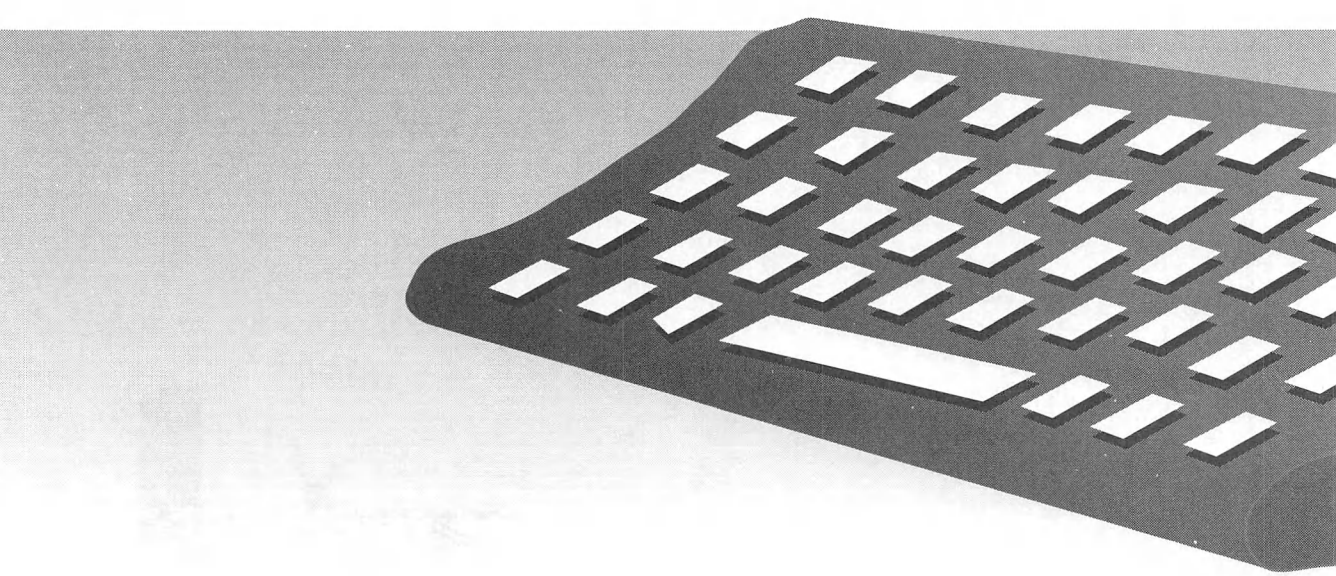
Pro AudioSpectrum 16 Compatible Cards

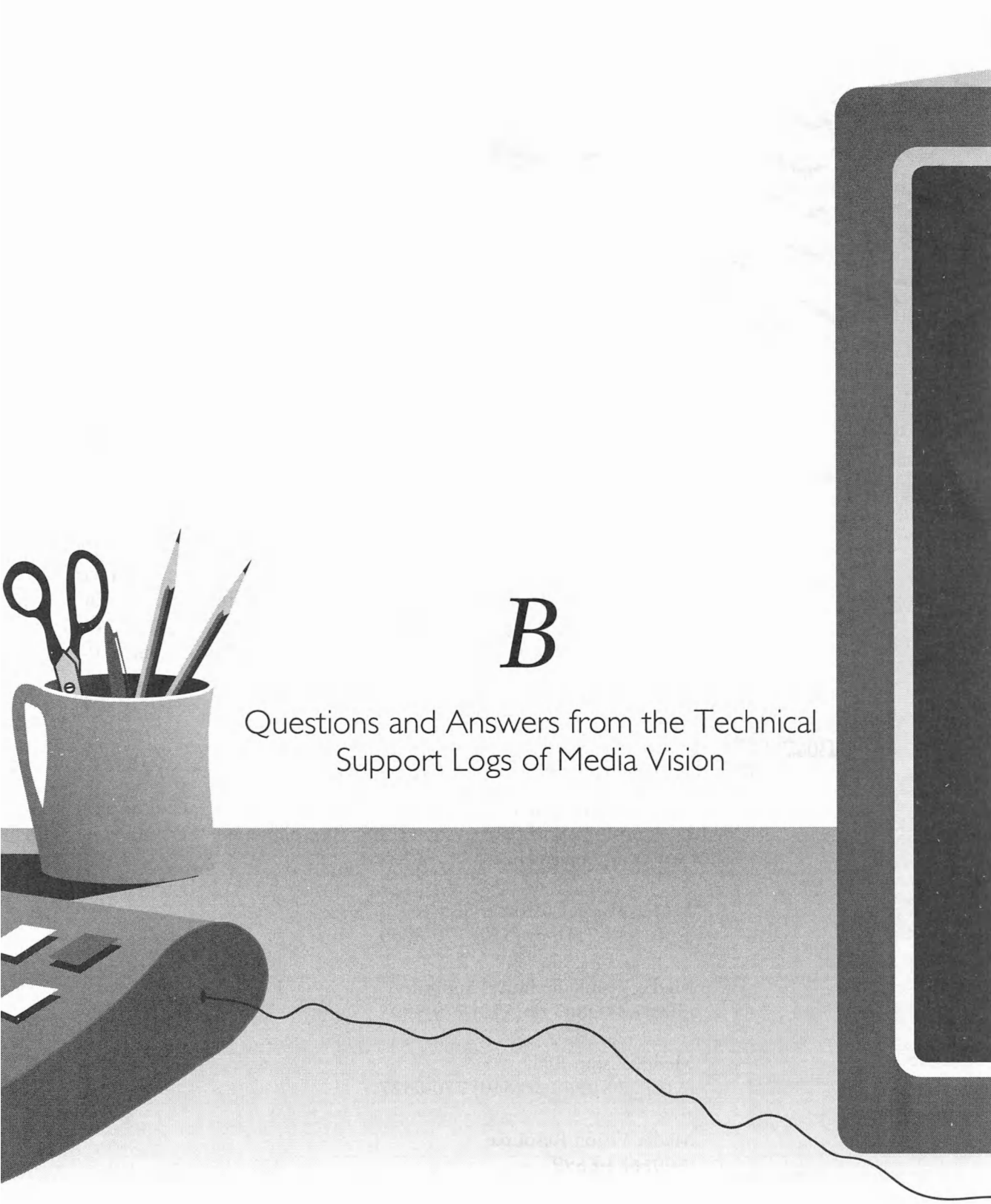
As mentioned in Chapter 1, Media Vision sells its chip set, essential components for building a sound card, to other companies who wish to manufacture sound cards. Two of the most prominent are Logitech and Sigma Designs. The Logitech Soundman 16 and the Sigma Designs Win-Storm are such close cousins to the Pro AudioSpectrum 16 family that most any software advertised as written for the Pro AudioSpectrum 16 card should run on these cards.



NOTE: *For more detail on the new Memphis multimedia system, see Chapter 1.*

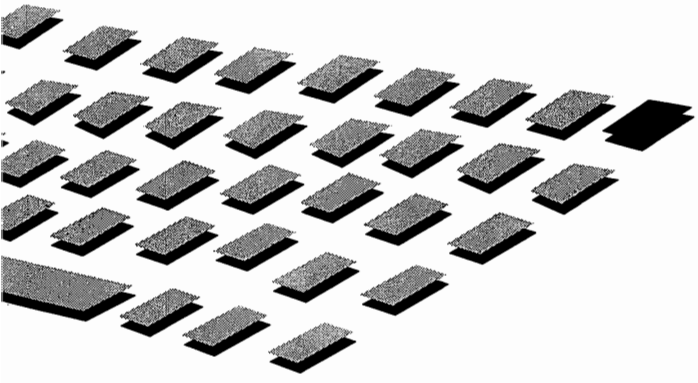






B

Questions and Answers from the Technical Support Logs of Media Vision



THIS appendix contains the questions most frequently asked of the Media Vision technical support department. The questions and answers come directly from the documents used by technical support specialists when they talk to you on the phone.

If you're comfortable and familiar with some minor technical terms, this appendix can serve as a quick troubleshooting guide. If you don't yet understand technical terms like IRQ and DMA, read Chapter 2 prior to using this appendix. Some of the topics below are covered in more detail in other chapters of this book. For detailed explanations and insights to some of the topics, refer to the appropriate chapters.

RESOURCES

This appendix often refers to two Media Vision departments and the Media Vision Bulletin Board System (BBS). The phone numbers are listed below for your convenience.

Media Vision Customer Service
(800) 348-7116 or (510) 770-8600

Media Vision Technical Support
(800) 638-2807 or (510) 770-9905

Media Vision BBS
(510) 770-0968 or (510) 770-0527

Media Vision Resource
(800) 684-6699

Customer Service accepts all orders for any Media Vision product, including driver updates, new manuals, cable kits, and the rest. Technical Support cannot ship anything to you, unless they determine that your sound board is defective, but they are available if you have a technical problem. To download the latest drivers and software, call the Media Vision BBS. The Media Vision Resource is a place to get Media Vision products at discount prices.

ABBREVIATIONS

The following abbreviations are used by Media Vision and can be found throughout this appendix:

Studio16	Media Vision Pro AudioStudio 16
16XL	Media Vision Pro AudioStudio 16XL
PAS16	Media Vision Pro AudioSpectrum 16
PASPlus	Media Vision Pro AudioSpectrum Plus
PAS8	Media Vision Original Pro AudioSpectrum 8-bit board
TB	Media Vision Thunder Board
Pro Audio	Studio16, 16XL, and PAS16
AdLib	AdLib sound card
Sound Blaster	Sound Blaster sound card
MPU-401	Roland's proprietary MIDI interface protocol
BBS	Bulletin Board System
WIN31	Windows 3.1
RMA	Return Material Authorization number

SOUND TYPES

These are the sound types we'll be referring to throughout this section:

Digital Audio	Recorded sounds, usually speech and sound effects. These sounds are produced by the digital-to-analog converter (DAC) on the PAS16, Studio16, and 16XL. WIN31 uses the file extension .WAV for digital audio.
Synthesized Audio	FM sounds, usually music, but can also be used to produce speech and sound effects. These sounds are produced by the FM Synthesizer on any Media Vision sound card. WIN31 uses the file extension .MID for synthesized audio.
Audio CD	Audio CD (also known as Red Book) sounds. These sounds are produced by the CD-ROM drive, not by the sound board.

PC Speaker	Crude music tones, speech, and sound effects produced by the system timer chip on the motherboard. These sounds are played back by the internal PC Speaker.

SUPPORTED CD-ROM DRIVES

See your Media Vision User's Guide for a listing of compatible CD-ROM drives. A list can also be found in Chapter 11 of this book.

If your CD-ROM drive is not on this list, it will NOT work with your Media Vision sound card (the SONY CDU-535 and the Laser Library are not SCSI-compatible). If your CD-ROM drive is on this list and you would like to use the Pro Audio's SCSI interface to control it, call (800) 356-7886 to order an internal cable/driver kit or an external cable/driver kit.

PRO AUDIO MISCELLANEOUS INFORMATION

The following are some important aspects of the Pro Audio cards that you should be aware of:

- The Pro Audio sound cards use two sets of DMAs and IRQs: one set for Sound Blaster emulation and a second set for the higher-level Pro AudioSpectrum 16 functions. See the default settings in the following sections, or in Chapter 3.
- Pro Audio sound cards do not support hardware compression.
- The Sound Blaster DAC supports hardware decompression (2:1,3:1,4:1). The PAS16 DAC does not support this.
- Only the Studio16 and 16XL offer hardware support for MPU-401 emulation.
- All of the Pro Audio sound cards have a built-in SCSI CD-ROM interface, SCSI-1 standard.
- The card measures 7 7/8 inches by 3 7/8 inches and requires a 16-bit slot.
- Stereo Line-In and Line-Out are 1/8-inch stereo jacks. Supported speakers are 4-ohm or 8-ohm speakers; self-amplified speakers are optional.

- Microphone Input is a 1/8-inch mono jack. Supported microphones are 600 to 10K ohm dynamic.
- Internal Audio (CD) Connector at J5 is a 5-pin header connector, 0.100-inch space header, pin 1=ground, 2=right in, 3=shielded ground, 4=left in, 5=ground.
- MIDI Connector/Joystick Port has a D-15S connector type. The pinouts are the following:

1	+5VDC
2	JOYSTICK 1 FIRE 1
3	JOYSTICK 1 X
4	GROUND
5	GROUND
6	JOYSTICK 1 Y
7	JOYSTICK 1 FIRE 2
8	+5VDC
9	+5VDC
10	JOYSTICK 2 FIRE 1
11	JOYSTICK 2 X
12	MIDI OUT (GROUND on MIDI Mate)
13	JOYSTICK 2 Y
14	JOYSTICK 2 FIRE 2
15	MIDI IN (+5VDC on MIDI Mate)

BEFORE CALLING TECHNICAL SUPPORT FOR HELP

To better serve your needs for technical support on the PAS16, we suggest that you have the following information available. Make a list of all peripheral devices in your system and the DMA or IRQ used by each, if any. Some common examples are a scanner, tape backup, SCSI controller, fax/modem, or bus mouse. Make sure there are no conflicts with the DMAs or IRQs that are selected for the Pro Audio sound card.

One way to determine the DMA and IRQ settings for the Pro Audio sound card is to run INSTALL from the directory where the Pro Audio files reside.

Another way is to examine your CONFIG.SYS file. Find the line that contains the name "MVSOUND.SYS". In this line, "D:*n*" gives the value of the chosen DMA; "Q:*n*" gives the value of the IRQ setting.

Check to make sure that you don't have another sound device or another joystick port in the system. Otherwise, follow the standard troubleshooting steps that follow.

If you need to call Media Vision Technical Support, the following information will be requested: computer type, name brand, and model; is it a 286, 386, or 486?; CPU speed; is the bus speed at 8MHz? If you have any other cards in the system, please let them know right away.

STANDARD TROUBLE-SHOOTING STEPS

When you run into problems with your Media Vision sound card, you should try the standard troubleshooting steps listed here:

1. Temporarily use the generic CONFIG.SYS and AUTOEXEC.BAT files given in the following sections.
2. Temporarily reduce the computer CPU speed. Usually this can be accomplished by turning off the turbo mode or disabling the internal/external memory cache by going into the computer's advanced CMOS setup.
3. Temporarily reduce the computer bus (I/O CLK) speed to 8MHz. The PAS16 was designed around the IBM AT specification that uses this bus speed. Please note that the computer bus speed is not the same as the CPU speed. Once everything works fine at 8MHz bus speed, you can experiment at a higher bus speed.
4. Temporarily remove other peripheral boards from the computer, such as a scanner board or tape backup.
5. Try Pro Audio in another 16-bit slot.
6. Try Pro Audio in another computer.
7. If you do not hear any sound, recheck the speakers/headphones connections.

Generic CONFIG.SYS

A CONFIG.SYS file should look something like the one shown here:

```
DEVICE    = C:\WINDOWS\HIMEM.SYS
FILES     = 30
BUFFERS   = 10
LASTDRIVE = X      (Refer to the SCSI INTERFACE section question 16.)
DEVICE    = C:\PROAUDIO\MVSOUND.SYS D:n Q:n
(Refer to the PAS16 SOFTWARE INSTALLATION section question 7.)
DEVICE    = C:\PROAUDIO\TSLCDR.SYS /D:MVCD001 /R /P:3
(SCSI CD-ROM driver. Refer to the SCSI INTERFACE section question 1. Note that
n=the number of the DMA or IRQ channel.)
```

Generic AUTOEXEC.BAT

A generic AUTOEXEC.BAT file should look something like the one shown here:

```
@ECHO OFF
PATH C:\;C:\DOS;C:\WINDOWS;C:\PROAUDIO
PROMPT $P$G
C:\PROAUDIO\MSCDEX.EXE /D:MVCD001 /M:10 /L:X /V
(CD-ROM driver. L:X is the drive letter assigned to the CD-ROM drive.
Refer to the SCSI INTERFACE section.)
```

DEFAULT DMA AND IRQ SETTINGS USED BY THE PRO AUDIO 16

The default settings used by your Pro Audio 16 sound card are:

- DMA 3 at default. Selectable among 0, 1, 2, 3, 5, 6, 7. Low-order DMAs are 0, 1, 2, 3. High-order DMAs are 5, 6, 7.
- IRQ 7 at default. Selectable among 2, 3, 5, 7, 10, 11, 12 and 15 by changing the Q:*n* parameter of MVSOUND.SYS in CONFIG.SYS. Low-order IRQs are 2–7. High-order IRQs are 10–12 and 15.



NOTE: *Some computers do not support high-order DMA and IRQ. Please contact the manufacturer of your computer for assistance, if necessary.*

THE PAS16 I/O PORT ADDRESS MAP

The details of the PAS16 I/O port address map are beyond the scope of this book. Refer to your Pro Audio User's Guide.

DEFAULT SETTINGS USED BY THE SOUND BLASTER

Listed here are the default DMA and IRQ settings used by the Sound Blaster section of your Pro Audio card:

- DMA 1. This setting is fixed if Sound Blaster compatibility is enabled.
- IRQ 5 at default. Selectable among 2, 3, 5, and 7 by changing jumper J12 on the PAS 16.
- I/O port 220H at default. Selectable among 220H, 230H, and 240H by changing jumper J10 on the PAS 16.
- The version of Sound Blaster's DSP (digital signal processing chip) that is supported is v1.5.



NOTE: *The Studio16, 16XL, and newer PAS16 use a software switch in MVSOUND.SYS rather than jumpers to set the preceding settings.*

QUESTIONS AND ANSWERS

The remainder of this appendix is in a question and answer format. It is divided into sections according to specic topics, including PAS16 hardware installation, PAS16 software installation, SCSI interface, and various specific software titles.

PAS16 Hardware Installation

Q: Do I have to change any jumpers before I install the PAS16?

A: The default settings work in most computers. Only try different IRQ or DMA channels if you experience any problems or know that these settings are used by another peripheral board in the same system.

Q: What are the symptoms of a DMA and IRQ conflict on the PAS16 section?

A: DMA conflict causes digital audio to be distorted or no digital audio. It can also cause the system to hang, reboot, or issue a parity error. IRQ conflict causes digital audio to loop and no synthesized audio.

Q: What are the symptoms of an IRQ and I/O port conflict on the Sound Blaster section?

A: The game does not produce digital audio or digital audio is distorted, or running the game causes the computer to lock up.

Q: How do I change the DMA and IRQ settings for the PAS16 section of the sound card?

A: You can change the PAS16 DMA and IRQ settings by changing the D:*n* and Q:*n* parameters on the MVSOUND.SYS statement in the CONFIG.SYS file.

Q: How do I change the IRQ and I/O port settings for the Sound Blaster section of the sound card?

A: You can change the Sound Blaster IRQ and I/O port settings by changing the jumpers at J12 and J10 on the sound card. On the Studio16, 16XL, and REV.D PAS16, you can make these changes via the S: parameter on the MVSOUND.SYS statement in CONFIG.SYS.

Q: Can the PAS16 section and the Sound Blaster section share the same settings?

A: No. The settings must be different to prevent a DMA and IRQ conflict.

Q: What causes a memory parity error?

A: A DMA conflict causes a memory parity error.

Q: Which jumpers on the sound card can I change?

A: The only jumpers that can be changed are the Sound Blaster jumpers: J10 for I/O port, J11 for DMA sharing, and J12 for I/O port.

Q: How do I disable Sound Blaster-compatibility mode?

A: Float all of the shunts (change the jumper settings) for J10, J11, and J12 (by putting the shunt on one pin only). This disables the Sound Blaster IRQ, I/O port, and DMA 1. On the Studio16, 16XL, and PAS16, use the S:0 parameter in the MVSOUND.SYS statement in CONFIG.SYS.

Q: Does the PAS16 work in a 486/50? What computers does the PAS16 work in?

A: The PAS16 was designed around the IBM AT specification. It works in a 486/50 or faster computer if the bus (I/O CLK) speed is lowered down to 8MHz. Please note that the bus speed is not the same as the CPU speed. Once PAS16 works fine at 8MHz bus speed, you can experiment at a higher bus speed.

PAS16 Software Installation

Q: How much disk space is needed to load all the files on the hard drive?

A: About 5 to 6MB.

Q: What drivers can be loaded high?

A: If there is sufficient upper memory available, you can load MVSOUND.SYS, TSLCDR.SYS, and MSCDEX.EXE high.

Q: The INSTALL program causes my computer to lock up, so how do I manually install the software?

A: To manually install the PAS16 DOS software from the Installation Disk, perform the following steps:

1. Add "C:\PROAUDIO" to the path statement in your AUTOEXEC.BAT file.
2. Reboot the computer.
3. Type **MD C:\PROAUDIO.** (This will create a "PROAUDIO" directory on your hard drive.)
4. Type **MD C:\PROAUDIO\WAVE.**

5. Type **MD C:\PROAUDIO\STEREOFX.**
6. Type **MD C:\PROAUDIO\TBPRO.**
7. Copy all the files from the PAS16 Installation Disk to the new C:\PROAUDIO directory.
8. Copy DIGISNDW.LZH to C:\PROAUDIO\WAVE.
9. Copy MOD.LZH to C:\PROAUDIO\TBPRO.
10. Copy SFX.LZH to C:\PROAUDIO\STEREOFX.
11. From the C:\PROAUDIO\WAVE prompt, type **LHARC *X*: DIGISNDW.LZH.**
12. From the C:\PROAUDIO\TBPRO prompt, type **LHARC *X*: MOD.LZH.**
13. From the C:\PROAUDIO\STEREOFX prompt, type **LHARC *X*: SFX.LZH.**
14. Add a line like the following to your CONFIG.SYS file. (Note that the name of the sound card may vary.)

```
DEVICE=C:\PROAUDIO\MVSOUND.SYS D:3 Q:7
```

15. Reboot the computer.

Q: What is MVSOUND.SYS for?

A: MVSOUND.SYS enables the PAS16 to produce sound under DOS.

Q: After I install the PAS16 Installation Disks and reboot the computer, right after MVSOUND.SYS finishes loading, I hear crackling/scratchy noises coming out of the speakers.

A: Make sure your Installation Disks are version 1.2 or later. Edit your CONFIG.SYS file and add **T:1** to the end of the MVSOUND.SYS statement. Save CONFIG.SYS and reboot. Refer to the PAS16 User's Guide v1.1, or Chapter 3 of this book, for an explanation.

Q: What parameters does MVSOUND.SYS support?

A: MVSOUND.SYS supports the following parameters:

- D:*n*, where *n* is 1, 3, 5, 6, or 7 for DMA on the PAS16 section of the sound card.

- Q:*n*, where *n* is 2–7, 10–12, or 15 for IRQ on the PAS16 section of the sound card.
- J:*n*, where *n* is 0 or 1, 1 for Joystick Enabled (default), 0 for Joystick Disabled.
- V:*n*, where *n* is from 1 to 100, which is the initial volume setting.
- T:*n*, where *n* is 0 or 1, 1 to use the on-board oscillator, 0 to use the motherboard's oscillator. Some computers such as 486/33 OPTI have an improperly designed oscillator that causes the OPL3 FM chip on the PAS16 to produce random noise. See page 1-25 of the PAS16 User's Guide v1.1 for an explanation.
- Not all software supports high-order DMA and IRQ (for example, TrakBlaster Pro).



TIP: *Review Chapter 3 for the latest information on parameters supported by the current version of MVSOUND.SYS.*

SCSI Interface

Q: What is TSLCDR.SYS?

A: TSLCDR.SYS is a CD-ROM driver written by Trantor Systems. It comes with the SCSI/Cable Driver Kit. The current version is 3.02. The following parameters are supported:

- /D:*x*, where *x* is any device name that you assign to the CD-ROM device.
- /W is for wait.
- /P is for polling.
- /R is for reset.



TIP: *Refer to Chapter 11 for more information on the parameters you can use with TSLCDR.SYS.*

Q: What is MSCDEX.EXE?

A: MSCDEX.EXE stands for Microsoft CD-ROM Extensions. The current version is 2.22. The following parameters are supported:

- /D:*x*, where *x* is the same device name that is assigned to the CD-ROM device by TSLCDR.SYS.
- /L:*X*, where *X* is the drive letter you want to assign to the CD-ROM drive.
- /M:*n*, where *n* is the number of 2K memory buffers; 10 is usually used.
- /V is for a verbose listing of information about memory usage.
- /E is for expanded memory usage.



TIP: *Refer to Chapter 11 for more information on the parameters you can use with MSCDEX.EXE.*

Q: Do I have to use the PAS16 SCSI interface to control a CD-ROM drive that has its own controller?

A: No. All you have to do is to make sure that the audio CD signals are routed from the CD-ROM drive to the PAS16. There are two ways to do this. The first way is to use a custom audio cable to connect the PAS16 internal audio input at J5 to the CD-ROM drive. This custom audio cable is part of the SCSI CD-ROM Cable/Driver Kit. If you would like to build this cable, please contact Customer Service to request the cable specifications to be faxed to you. The second way is to use a standard stereo phone extension cable to connect from the PAS16 1/8-inch stereo Line-In to the CD-ROM drive.

Q: I already have a SCSI adapter in my system. Do I have to remove it if I install the PAS16? Can multiple SCSI adapters co-reside in my PC?

A: You can have up to eight SCSI adapters in the same system. The PAS16 SCSI does not interfere with other SCSI adapters. The only possible conflicts would be conflicts with DMAs, IRQs, and I/O port used by the sound card.

Q: I have the Sony CDU-535 CD-ROM drive (or Laser Library). Can I use the PAS16 to control the Sony drive?

A: No. This Sony drive uses a proprietary Sony bus interface.

Q: Can I use the PAS16 to control other SCSI devices?

A: Yes. Trantor Systems can be reached at (510) 770-1400 to obtain a driver set that supports all SCSI hard drives, removable hard drives, and magneto-optical drives.

Q: I used to have the original PAS8 board and a SCSI/Cable Driver Kit and have just updated to the PAS16. Do I need an updated version of the CD-ROM drivers?

A: Yes. Contact Customer Service for a driver update for both TSLCDR.SYS and MSCDEX.EXE.

Q: I have the ATI Graphics Ultra (or Vantage). When the TSLCDR.SYS driver loads, it detects two SCSI addresses. I also experience problems with digital audio and get a red screen on WIN31.

A: Make sure you have TSLCDR.SYS v1.46B or later.

Q: Which SCSI interface is used on the PAS16? How do I write device drivers for it?

A: Device drivers are available directly from Media Vision Customer Service.

Q: What is the transfer rate of the PAS16 SCSI interface?

A: It has a maximum transfer rate of 690KB/sec.

Q: I get the error "No SCSI host adapter found."

A: First, the SCSI CD-ROM driver is board-dependent. If you would like to use the PAS16 to control the CD-ROM drive, you need to use TSLCDR.SYS driver v1.46B or later; otherwise, if you would like to use another SCSI controller (such as Adaptec or Future Domain) to control the CD-ROM drive, you need to use its driver (contact the SCSI controller manufacturer for the driver). Second, check the internal flat-ribbon SCSI cable to make sure it is properly connected to the PAS16. Third, make sure the red painted edge of the cable is closest to the 4-pin connector on the PAS16 at J4. Fourth, if the problem persists, please follow the Standard Troubleshooting Steps described in an earlier section of this appendix.

Q: I get the error "No devices respond on this SCSI host adapter."

A: First, make sure one of the computer's power cables has been connected to the back of the CD-ROM drive. Second, check the internal flat-ribbon SCSI cable to make sure it is properly connected to the back of the CD-ROM drive.

Q: I get the error "Device driver not found: MVCD001. No valid CD-ROM selected."

A: First, make sure that the device names for both TSLCDR.SYS and MSCDEX.EXE statements match. Second, if you are using DR DOS 6.0, it is necessary to change the device name for both TSLCDR.SYS and MSCDEX.EXE statements from "MVCD001" to "TSLCD".

Q: I get the error "Invalid drive specification" when I type the drive letter assigned to the CD-ROM drive.

A: First, make sure that you have "LASTDRIVE=*X*" in the CONFIG.SYS file, where *X* is the next logical drive letter after the letter assigned to the CD-ROM drive in the MSCDEX.EXE statement. Second, make sure that the TSLCDR.SYS driver statement precedes any driver statement that creates a RAM drive such as RAMDRIVE.SYS. Third, check if the TSLCDR.SYS and MSCDEX.EXE drivers have been loaded up properly.

Q: I get the error "CDR 101: Drive not ready."

A: First, make sure that you are not trying to read an audio CD disc. Second, check the internal flat-ribbon SCSI cable to make sure it is properly connected. Third, make TSICR.SYS the last line in CONFIG.SYS, and MSCDEX.EXE the first line of AUTOEXEC.BAT.

Q: I get the error "CDR 103: CD-ROM not High Sierra or ISO-9660 format reading drive *X*. Abort, Retry or Ignore?".

A: First, check to make sure that you are not trying to read an audio CD disc. Second, this is usually caused by a software conflict; reduce to the generic CONFIG.SYS and AUTOEXEC.BAT and try again.

Q: I do not hear any audio CD at all; or, how do I connect the internal CD Audio cable?

A: The internal CD Audio cable may not have been properly connected or it is defective. There are two ways to route audio CD. The first way is to use a custom audio cable to connect the PAS16 internal audio input at J5 to the CD-ROM drive. This custom audio cable is part of the SCSI CD-ROM Cable/Driver Kit or included with the PRO16 Kit; you can also use a standard stereo phone extension cable to connect from the PAS16 1/8-inch stereo Line-In to the CD-ROM drive.

Stereo Studio FX

Q: Does SFX support 16-bit PCM recording and playback?

A: No. SFX only supports 8 bits.

Q: Sound loops when playing back under SFX. DMA 3 and IRQ 7 are set in CONFIG.SYS file. All other applications work fine.

A: First, make sure that the file is not a 16-bit recorded file. SFX only supports 8-bit recorded files. Second, try using a high-order DMA, such as DMA 5.

SP Spectrum

Q: TAPIMV issues the error "FM sound card not found."

A: Make sure your Installation Disks have the current version of 1.2. Add "T:1" to the end of the MVSOUND.SYS statement. Refer to the PAS16 User's Guide v1.1 for an explanation.

Q: I have the Media Vision MIDI Mate v1.0 (MIDI connector box), which worked fine on the PAS8. After I upgraded to the PAS16, MIDI IN does not work using the same MIDI Mate.



A: Inside MIDI Mate, there is a chip at U1 (next to the MIDI cable) called an opto-isolator. The old part number is 6N136. For the MIDI Mate to work with the PAS16, it needs the new part number, which is 6N138. Contact Customer Service for an RMA number to have this chip updated if you have the old part number.

Q: The FMEDIT section in the PAS16 User's Guide has pages missing to describe the Mixer, Display Setup, Trigger Note, Quitting, and Pop-up Windows.

A: Please contact Customer Service to have a copy of this sent by mail.

Q: I don't hear any sound when I play a file with an .ROL or .MID extension in SP Spectrum.

A: Make sure that Port is set to 2 for playing songs using the internal FM synthesizer. Set Port to 1 for playing out of an external MIDI equipment. Refer to the SP Spectrum section in the PAS16 User's Guide for additional information.

Q: I get the error "Run time error. Divide by 0" when I run SP Spectrum.

A: The error is caused by an incorrect setup of the memory manager, commonly seen in QEMM and Weitek co-processor in 486 machines. Contact Quarterdeck or the manufacturer of the memory manager for assistance with reconfiguration.

TrakBlaster Pro

Q: While running TBPRO, a MOD file plays for 20 seconds then abruptly stops and the system hangs up.

A: This problem is caused by a DMA conflict. Make sure the PAS16 section is not set for DMA 1 unless Sound Blaster compatibility has been disabled.

Q: Does TBPRO support high-order DMA and IRQ?

A: Older versions of TBPRO only support DMA 1, 3 and IRQ 2, 3, 5, 7. The newest version (1.05) does support high-order settings.

Monologue

Q: Running Monologue causes my computer to lock up.

A: Monologue uses the Sound Blaster section of the sound card. Monologue defaults to IRQ 7, whereas the Sound Blaster section of the sound card (at J12) defaults to IRQ 5. To change Monologue's IRQ setting to match the card's setting, run Monologue's INSTALL program. Press F2 to select a sound accessory. Select the "Media Vision Products" driver and press ENTER. Use TAB to highlight the IRQ settings. Then use UPARROW to select IRQ 5 (or whichever IRQ is selected at J12). Press ENTER when done. Press F5 to install Monologue to the hard drive. Press F9 when finished.

Q: All possible Sound Blaster IRQs at J12 have been tried and Monologue still locks up or does not produce any audio.

A: Select the "AdLib" driver instead of "Media Vision Products" and try again.

Q: DR DOS 6.0 memory manager causes Monologue to lock up the computer when using ALT-T to activate Monologue.

A: First, run MEMMAX –U to disable upper memory. Second, run Monologue. Third, run MEMMAX +U to re-enable upper memory.

Q: The TALKDRVR.SYS is missing from the Monologue v3.0 for DOS disk.

A: This driver was provided with Monologue v2.0 and has been removed from the disk for v3.0 by the software manufacturer (First Byte).

Q: The Monologue User's Guide indicates that there should be two 5 1/4-inch disks.

A: There is only one 5 1/4-inch disk.

Q: The ALT-T key combination does not work.

A: Some programs like WordPerfect or WordStar also use the same key combination, which creates a conflict with Monologue. To resolve this problem, you need to assign a new key combination. Go into the Monologue directory. Run CONFIG.BAT. Select Set Speech and Display Parameters. From the Info Screen, select Skip. Press TAB and save this. Back at the Main menu, select Change Hot Key Assignment. Finally, choose a new ALT key combination that does not conflict with the program you wish to configure Monologue for.

Q: Monologue's ALT-T key combination does not work properly on my machine. Sometimes it works and sometimes strange things happen.

A: First, delete the Monologue directory completely. Reinstall Monologue and then try again.

Q: When I try to run SAYFILE *filename*.doc at the DOS prompt, nothing happens.

A: SAYFILE.BAT is missing a parameter that allows a DOC filename to be passed to the SAYF.EXE command so that it can speak the file. Modify SAYFILE.BAT by changing the third line from SAYF to **SAYF %1** and then try again. Run SAYFILE *filename*.doc. Press ENTER. A graphical screen displays. Press ENTER again, and the file should be read aloud.

Lotus 1-2-3 for Windows with Multimedia Help

Q: Lotus 1-2-3 with Multimedia Help requires 4MB virtual memory to run under WIN31. WIN31 crashes when Lotus is initialized.

A: First, defragment your hard drive. Then, go to the Control Panel. Select 386 Enhanced. Select Virtual memory. At default, virtual memory size is set to 0KB and Type is Temporary. Select Change. Click on the down arrow in the Type field and select Permanent. Click on OK, and answer YES to all the prompts. Restart WIN31 and try again.

Windows Drivers and Pocket Tools

Q: What do I need to do before I install the PAS16 Windows Drivers disk?

A: If you have the PAS8 Windows drivers installed or have an older version of PAS16 drivers, click the Drivers applet in the Control Panel and remove every driver that references Pro AudioSpectrum or Media Vision. Restart WIN31 and then install the new drivers.

Or, you may have Norton Desktop for Windows, which interferes with the Windows driver INSTALL program. To work around the problem, go into SYSTEM.INI, in the [boot] section. Replace SHELL=NDW.EXE with **SHELL=PROGMAN.EXE**. Install the Windows drivers, restart WIN31, and make sure that all sounds work. Replace the PROGMAN with NDW in SYSTEM.INI. Restart WIN31. Go into Program Manager and select Run in the File menu to execute SETUP /P so that Norton registers the Multimedia Tools Group, which has just been created by the INSTALL program.

Or, you may be using DR DOS 6.0 SHARE, which causes the INSTALL program to crash the system. To work around the problem, remove SHARE. Reboot the computer. Then install the Windows drivers.

Q: While installing the PAS16 WIN31 drivers, I get the error "You must first load Multimedia Extensions."

A: First, go into the Drivers applet of the Control Panel to check the installed drivers list. There must be MIDI Mapper, Timer, [MCI] Sound, [MCI] MIDI Sequencer. Second, check the SYSTEM.INI file. Under the [boot] section, there should be DRIVERS=MMSYSTEM.DLL. No files should follow the DLL. If any of these items are missing, WIN31 has not been properly installed. Installing WIN31 over an older version of Windows may have caused this problem. The only solution is to install WIN31 from scratch and then install the PAS16 WIN31 drivers again.

Q: After the PAS16 Windows drivers installation, starting WIN31 causes the error "Can't find ver. 2.00 of VDMAD.386."

A: Some Windows applications replace this driver with their own DMA driver, such as Norton tape backup software, which puts the statement DEVICE=VDMADX.386 under the [386Enh] section of SYSTEM.INI. First, put a semicolon (;) in front of the whole statement. Second, add the statement "DEVICE=*VDMAD" to the beginning of the [386Enh] section. Restart WIN31 and try again.

Q: Do I need MVSOUND.SYS for Windows?

A: No. In the past, the PAS16 Windows drivers depended on MVSOUND.SYS. The current version of the drivers does not require it.

Q: Can I use different IRQ and DMA settings under Windows than under DOS?

A: The DMA set in SYSTEM.INI for Windows can be different from the DMA set in CONFIG.SYS for DOS. The interrupts must be the same.

Q: What is the advantage of using a high-order DMA and IRQ?

A: High-order DMA allows 16-bit DMA transfer, which enables the MVPROAUD.DRV sound driver to handle digital audio more efficiently and also to provide more available DMA selections. High-order IRQ only provides more available IRQ selections.

Q: Sound plays normally under DOS using the selected DMA and IRQ settings, but loops under Windows using the same DMA and IRQ settings.

A: This is caused by an IRQ conflict. Edit the SYSTEM.INI file to change the IRQ setting under the [mvproaud.drv] section.

Q: Pro Mixer's wave meter points at the beginning of the red area instead of at zero.

A: The release of WIN31 drivers v1.4 or better will correct this problem. Please contact Customer Service to obtain the latest driver.

Q: What do I have to do before I can record using Pocket Recorder or Sound Recorder?

A: Go into Pro Mixer or Pocket Mixer to set the audio input source to recording mode.

Q: When I record at 16-bit mode, there is very bad clipping or it does not work at all. 8-bit recording works fine.

A: If you are using a low-order DMA, change to a 16-bit DMA under the [mvproaud.drv] section of SYSTEM.INI and try again.

Q: Recording at 8-bit is very scratchy. 16-bit recording does not have this problem.

A: The PAS16 has a 16-bit PCM DAC. Recording at 8-bit using a 16-bit DAC is definitely more noisy than recording at 8-bit on the PAS8, which only has an 8-bit DAC. In release v1.4 or better, Pocket Recorder has a feature to convert a 16-bit recorded file to 8-bit to resolve the problem. Please check with Customer Service.

Q: Does the Pocket Recorder support the Cut, Copy, and Paste features?

A: These features will be supported in the next release. Please check with Customer Service to be put on the waiting list for WIN31 Drivers v1.4.

Q: I get the errors "Can't find input device with pid." and "Can't find output device with pid." when trying to run Pocket Recorder.

A: Make sure the MVSOUND.SYS statement appears in CONFIG.SYS and that the driver loads properly when the computer boots up.

Q: I get the error "PREC has caused a General Protection Fault error in USER.EXE..."

A: This error occurs most frequently in 286 computers and also in faster computers that have less than 2MB of virtual memory under Windows. To troubleshoot this problem: First, download PRECGPF.ZIP (PREC.EXE with GPF error checking) from the Media Vision BBS. Second, run DRWATSON.EXE (a WIN31 utility). Third, run the new Pocket Recorder. When WIN31 issues the GPE, all the necessary information is stored in DRWATSON.LOG. Fourth, print out this log and fax it to Technical Support at Media Vision. Upon receiving the information, they will forward to Engineering and await their response.

Q: If Pocket Recorder is used to record a 16-bit Wave file, which is saved then played from Media Player, the file plays properly to the end but the thumb button on the position slider will not have reached the end. The thumb button usually stops around the halfway mark. If the position button is dragged to the right of this mark, the message "The specified parameter is out of range for the specified command" pops up. Dragging past the halfway mark and playing the file sometimes results in white noise.

A: This problem has been reported to Engineering and will be fixed in the future release of WIN31 Drivers v1.4. Please contact Customer Service to be put on the waiting list.

Q: Pocket Recorder's OLE (Object Linking and Embedding) feature does not work properly.

A: The OLE feature is not fully implemented. Please document the problems in detail and fax or mail to Technical Support to be forwarded to Engineering.

Q: A file recorded using RECFILE.EXE (a PAS16 DOS utility) plays back fine under Pocket Recorder, but this same file does not play back under Media Player. Loading this file under Sound Recorder causes the "General Protection Fault Error In Sound Recorder" message.

A: A new version of RECFILE.EXE, dated 6-22-92 or later, does not have this problem. On the Media Vision BBS, download P16REC.ZIP to get the new version; on CompuServe, download TOOLS.ZIP.

Q: How do I play audio CD under WIN31?

A: First, put an audio CD disc into the CD-ROM drive. Failure to do so causes the [MCI] CD Audio driver to not install properly. Second, go into the Drivers applet of the Control Panel. Click the Add button. Select the [MCI] CD Audio driver. Click the OK button. WIN31 prompts you for the Microsoft Windows Disk 4. Insert the appropriate disk and follow the instructions displayed on the screen. After this driver has been properly installed, go into Media Player. Select Device. CD Audio should be one of the choices for you to select from. If not, edit MPLAYER.INI to change CDAUDIO=0, to CDAUDIO=17, CDAUDIO.

Q: I do not get any FM sound when I run DOS games under the DOS shell of Windows.

A: If its a DOS game, just run it under DOS. Reconfiguring your Windows DOS shell can lead to difficulties.

Q: Under Media Player, CANYON.MID plays properly, but when I play other MIDI files, I don't hear any music.

A: WIN31 only supports General MIDI. The MIDI files that you have may be non-General MIDI. Try the following: Go into the MIDI Mapper applet of the Control Panel. Select the Pro AudioSpectrum setup. Click Edit. Under the Port Name column, select Media Vision FM Synth for channels 1–10 and 13–16, then save the setup. Now all MIDI songs should play; however, they may not sound right.

PAS.EXE

Q: How do I adjust the volume for the Sound Blaster section of the sound card?

A: Run PAS SET Sound Blaster TO *nn*, where *nn* is 0-100.

Q: DOS software produces no volume or very low volume, especially after exiting WIN31.

A: Run PAS RESET and try again.

RECFILE and PLAYFILE

Q: How do I use the command parameters V*nnn*, V+*nnn*, and F*n* for RECFILE.EXE?

A:
- In V*nnn*, *nnn* is a number from 000-127 for voice-activated level. Only sounds at and above this level get recorded.
- In V+*nnn*, *nnn* is 000-127. Record all when voice is activated at threshold.
- In F*n*, *n* is between 0-6 and is selected using the following guidelines:

Filter Value	Limiting Frequency	Sampling Rate	Frequency Range
6	18KHz	44KHz	near CD
5	16KHz	32KHz	cassette
4	12KHz	24KHz	FM radio
3	9KHz	18KHz	AM radio
2	6KHz	12KHz	telephone
1	3KHz	6KHz	male voice
0	0KHz		mute

Q: When PLAYFILE.EXE starts and stops, it produces a "popping" sound.

A: Get a newer version of PLAYFILE.EXE. Download P16REC.ZIP from the Media Vision BBS.

Q: I am having trouble recording 16-bit Wave files using the V+*nnn* parameter.

A: Get a newer version of RECFILE.EXE. Download P16REC.ZIP from the Media Vision BBS.

Q: I do not hear any sound when I play back under WIN31 Media Player a file that has been recorded using RECFILE.EXE.

A: Get a newer version of RECFILE.EXE. Download P16REC.ZIP from the Media Vision BBS.

Q: I get the error "File is full or blocked" when I run RECFILE.EXE.

A: This problem is caused by slow system throughput. First, reduce to a generic CONFIG.SYS and AUTOEXEC.BAT. Second, make sure the hard disk has been optimized (unfragmented). Third, try at a lower sampling rate or try recording to a ramdrive. (Use DOS's RAMDRIVE.SYS.)

CD-ROM Applications

Q: After running Compton's Multimedia Encyclopedia, I only hear sounds out of one channel.

A: When Compton's plays digital audio (represented by a .WAV file extension), it puts the CD-ROM drive into mono mode and also shuts down one channel. For a temporary solution, you need to do a cold boot to reset the CD-ROM drive. To resolve this problem, download COMPTONS.ZIP from the Media Vision BBS or contact Customer Service to have this file sent via mail.

Q: While installing MS Bookshelf, at 99% completion, installation aborts with an error message in SETUP.INF file.

A: First, back up SETUP.INF. Second, go into SETUP.INF in your Windows directory and remove all lines that start with a semicolon (;). Then save it and reinstall Bookshelf.

Q: National Geographic Society's Presidents Starting With George runs fine but does not produce audio.

A: This application supports Sound Blaster. During installation, the driver statement DEVICE=SNDBK12.SYS 1 gets added to CONFIG.SYS. This driver defaults to IRQ 7, I/O port 220H and DMA 1. The Sound Blaster section of the sound card defaults to IRQ 5 and I/O port 220H. Edit the CONFIG.SYS to show **DEVICE=SNDBK12.SYS 1 5 220**, where 5 stands for IRQ 5 and 220 for I/O port 220H. The IRQ and I/O port should match those set at J10 and J12 on the PAS16.

Games

- All Sound Blaster games use DMA1, an IRQ, and an I/O port.
- Some Sound Blaster games look for the following statement in AUTOEXEC.BAT:

  SET BLASTER=A220 I5 D1 T3



TIP: *Review Chapter 3 for more information regarding the SET BLASTER setting.*

- Other Sound Blaster games do not look for this statement to find the settings but allow you to set the settings via an install program or by modifying a configuration file.
- A few games default to certain settings and do not allow the user to change these settings to match the board settings.
- Make sure that the game's settings match with the settings used by the Sound Blaster section of the sound card. At default, the Sound Blaster section uses IRQ 5, I/O port 220H. Refer to the game's User's Guide or contact the game manufacturer for assistance.
- Some games do not work properly if the computer is running in turbo mode. On most computers, there is a Turbo button on the front. If this button is not found, disabling the internal/external memory cache in the computer's CMOS setup achieves the same result.

Q: The joystick does not work at all or does not work properly when using the PAS16 joystick port.

A: First, some computers have a built-in joystick port on the motherboard. Other computers have a multi-I/O board that has a joystick port. Make sure that only one joystick port is enabled and the other one is disabled. Second, a computer that is too fast may also cause a problem. Reduce the computer's bus (I/O CLK) speed and try again. Refer to your computer's manual for instructions on how to adjust the bus (I/O CLK) speed. Third, contact the game manufacturer to ask for a joystick driver that works on fast machines.

Q: I do not get any sound effects and/or music while running games, or the sounds produced by the games are very faint.

A: Run PAS RESET and then try running the games again.

Q: I have games that were already installed before I installed the PAS16. These games are still playing through the internal PC Speaker.

A: You need to reselect the sound card or reinstall each game. Please refer to the User's Guides for these games or contact the game manufacturers for assistance.

Q: Links, The Golf Game, by Access, causes my computer to lock up.

A: Links defaults to IRQ 3 and I/O port 220. The PAS16 defaults to IRQ 5 and I/O port 220. Run SETBLAST.EXE (which came with Links) to change the defaults used by Links to match whichever settings are used by PAS16.

Q: Wing Commander II, by Origin, causes my computer to lock up or does not produce any digital audio.

A: First, make sure you have enabled speech in the WC II INSTALL.EXE program. Second, make sure you have expanded memory. Third, if you use QEMM 6.0, the Stealth option may distort sounds and lock up the computer. Fourth, check the WC II WC2.CFG file. At default, this file contains the line v a904 c27, where c indicates the Sound Blaster driver, 2 indicates I/O port 220, and 7 indicates IRQ 7. Change these two digits to match the Sound Blaster settings on the PAS16.

Q: Falcon 3.0, by Spectrum Holobyte, does not play any radio voice messages and produces popping sounds.

A: Try running the computer in non-turbo mode or by disabling the internal/external memory cache. If the problem persists, contact Spectrum Holobyte at (510) 522-1164 to request a software patch. The current revision is E. Any problems that you experience using this patch should be reported back to Spectrum Holobyte.

Q: I have some Disney Software games that have problems with digital audio.

A: If the game you are playing is for the Disney Sound Source only, you will not get sound with this board. Pro AudioSpectrum is not compatible with the Disney Sound Source. If you have questions or problems with the Disney games that are compatible with Pro AudioSpectrum 16, contact Disney Software at (818) 841-3326 for more information on configuring their software. You can also call the Disney BBS at (818) 567-4027 and download the file called SOUND.TXT to get the same information.

Q: I have some Lawrence Productions games that have problems with digital audio.

A: Contact Lawrence Productions at (800) 421-4157 to request an updated CT-VOICE.DRV. Any problems that you experience using this patch should be reported back to Lawrence Productions.

Q: LHX, by Electronic Arts, only plays sounds out of the internal PC Speaker. Also, Ultima V1, by Origin, produces distorted/noisy sound effects and music.

A: Please slow down the computer and try again. These games do not abide by the sound requirements of the FM synthesizer chip, creating a problem when running in fast machines.

Q: Robin Hood, The Legend of the Long Bow, by Sierra, produces poor or no digital audio.

A: If the PAS16 is currently set at IRQ 7, please select a different IRQ, for example IRQ 5, then try again.

Q: My game requires that I load the AdLib SOUND.COM or the Creative Labs SBSOUND.COM driver before starting up the game.

A: Media Vision has developed its own version of this driver. It is currently available on the Media Vision BBS. The filename is FM.ZIP.

Q: Ultima Underworld does not produce any digital audio, although the music plays fine.

A: After you have finished installing the game and have selected the Sound Blaster driver, run UWSOUND, which comes with Ultima Underworld. Select the IRQ setting that matches the PAS16 IRQ setting.

Q: I am having trouble running Interplay's Star Trek: The 25th Anniversary. I can't select Pro AudioSpectrum from the sound options.

A: The Pro AudioSpectrum option is for the PAS8. The PAS8 uses a two-operator FM synthesizer chip, and the PAS16 uses a four-operator FM synthesizer. The AdLib or Sound Blaster sound options should work fine.

Q: I am having trouble running Microprose's Gunship 2000.

A: Microprose has developed new sound drivers, which can be downloaded from the BBS. The file name is GUNSHIP.ZIP and contains different driver files for different IRQ settings. During the GS2000 setup routine, select the AdLib driver. Select the correct driver from this ZIP file to match with the IRQ setting set by MVSOUND.SYS. The drivers assume DMA 3 on the PAS16 and PASPlus and DMA 1 on all other cards.

Q: I am having trouble running King's Quest V on CD. Music plays fine but there is no speech.

A: You should perform the following steps:

1. From the DOS prompt, type the command **PAS RESET** and press ENTER. Then restart your game.
2. Make sure that the Sound Blaster driver has been selected.
3. Make sure that the CD-ROM drivers have been properly loaded and that the CD-ROM drive is responding, as KQ5 needs to access the CD-ROM drive to play speech.

Q: I am having trouble running Microprose's F1-17. Sounds play at the wrong speed.

A: This game plays FM synthesized audio. Make sure your Installation Disks have the current version of 1.2. Add **T:1** to the end of the MVSOUND.SYS statement. Refer to the PAS16 User's Guide v1.1 for an explanation.

Q: Does Wolfenstein 3D work on PAS16?

A: Yes. Media Vision has tested this game and has found that it works properly on PAS16.

Q: Does Sherlock Holmes on CD work on PAS16?

A: Yes. Media Vision has tested this game and has found that it works properly on PAS16.

Bus Mastering Device

Q: I hear a periodic clicking sound or static noise whenever the hard disk's light goes on (while drive is being accessed).

A: Lower the bus on-time and increase the bus off-time by the same amount so that the on-time is smaller than the off-time, or experiment to find the best ratio. Media Vision discovered this from using the Adaptec 1542B SCSI Hard Disk Controller. The install program for this card adds the following statements to CONFIG.SYS:

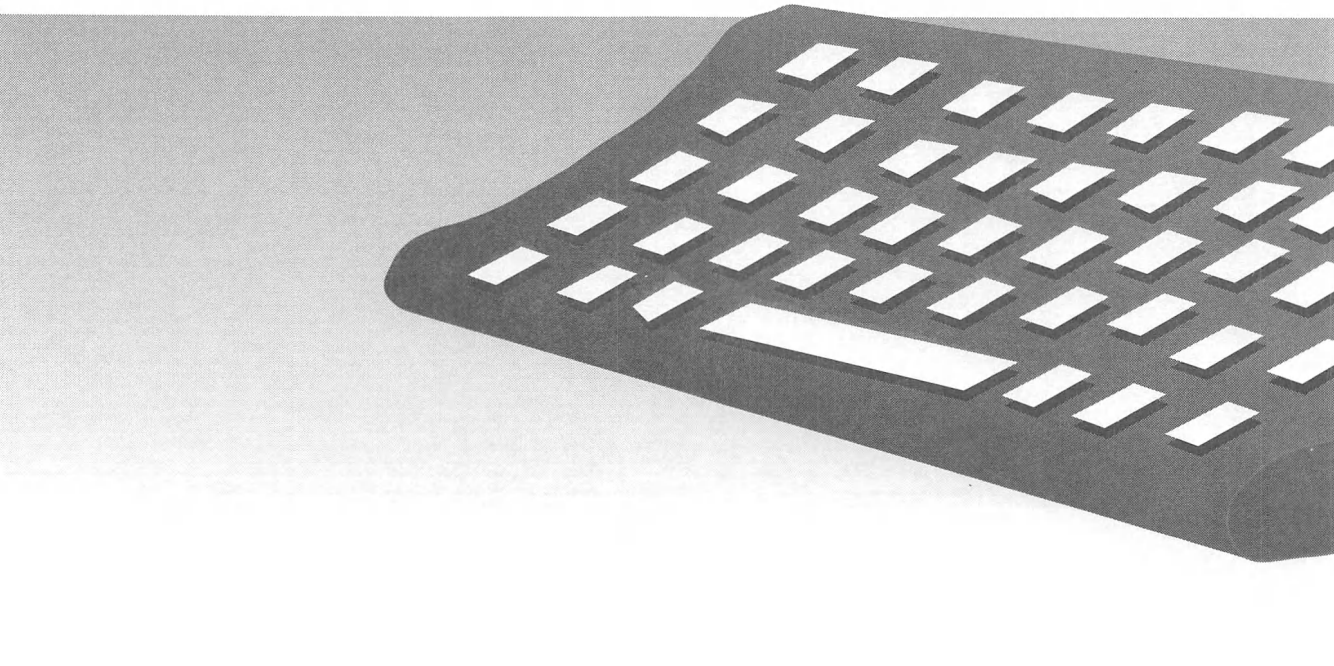
```
DEVICE=C:\ASPI4DOS.SYS /N11 /F5
DEVICE=C:\ASPIDISK.SYS
```

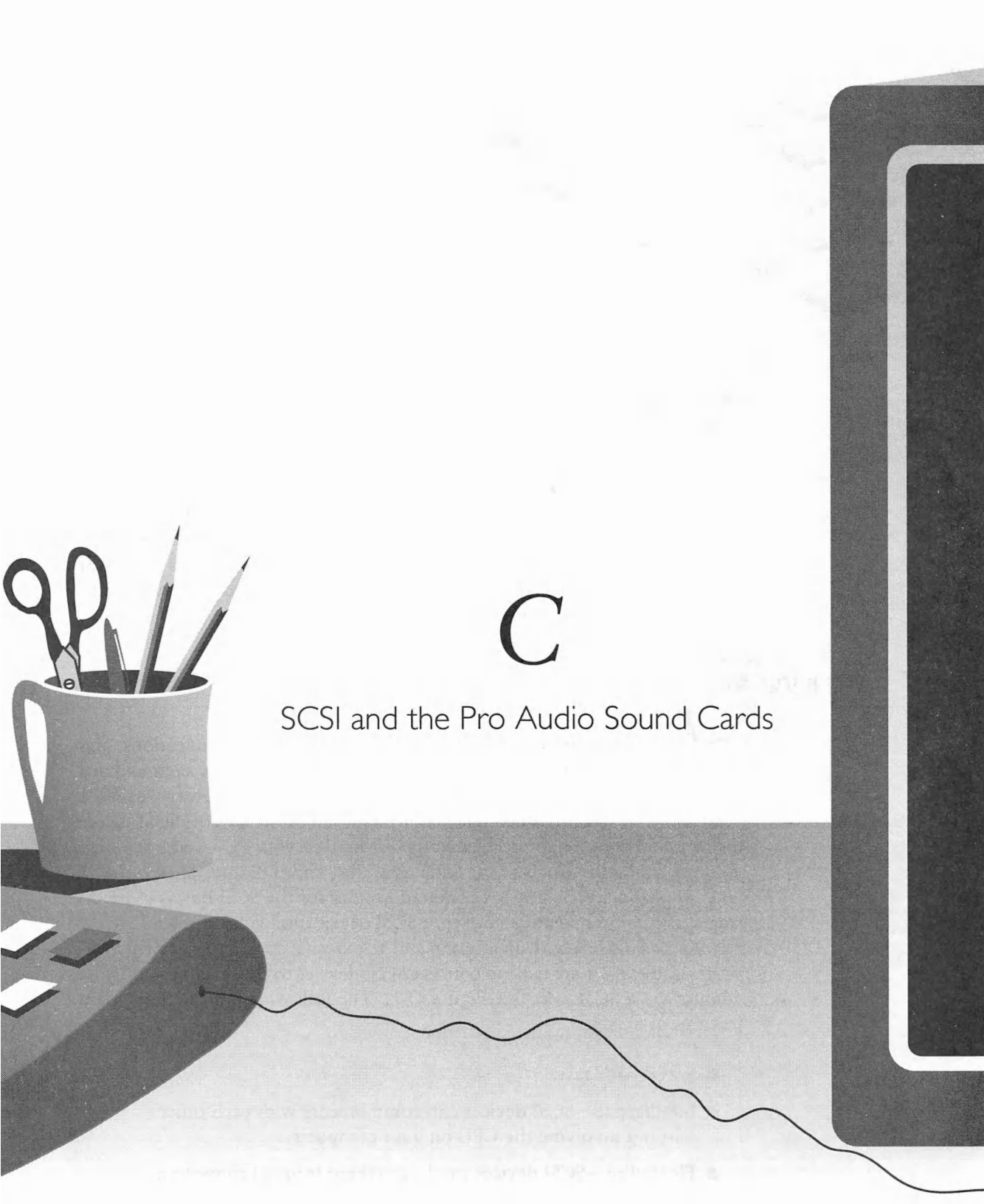
where N11 is 11/16ms and F5 is 5/16ms (default settings). Changing these settings may resolve the problem. If you are using the Adaptec 1542C, there is no current resolution.

OS/2 Driver Support

Q: Are there any plans to support OS/2?

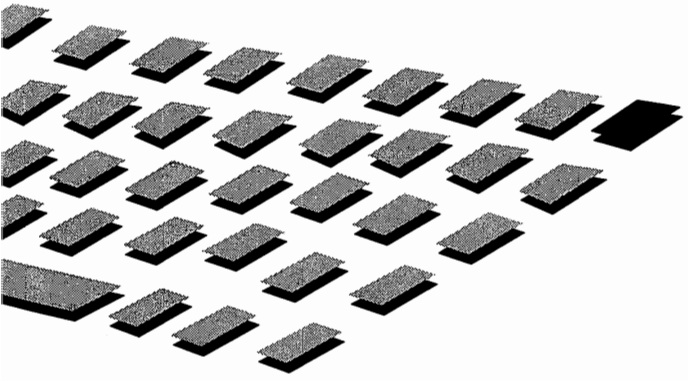
A: Yes, Media Vision is currently working on it. Please contact Customer Service to be put on the waiting list.





C

SCSI and the Pro Audio Sound Cards



ONE of the most attractive features of the Pro Audio sound card is its built-in *Small Computer System Interface* or *SCSI*, which allows you to connect a variety of peripherals such as CD ROM drives, scanners, hard disks, and removable disk drives to your PC. In this appendix we will explore SCSI (pronounced "scuzzy") and its possibilities. We will also preview SCSIworks! from Trantor Systems, a package that empowers the SCSI connector on your Pro Audio sound card and allows you to use any popular SCSI connector devices with your PC.

WHAT IS SCSI?

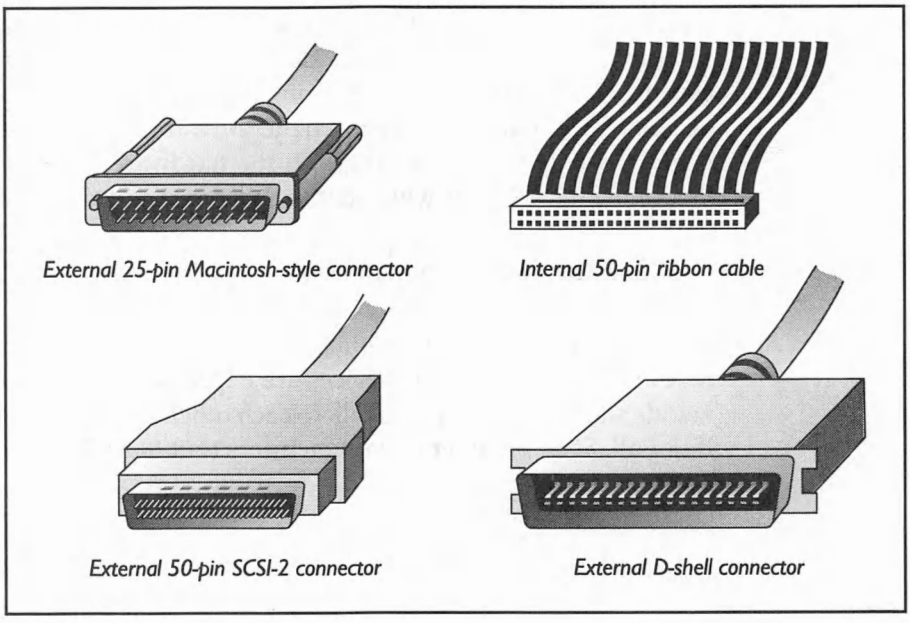
SCSI is a standard that specifies the electrical connections and communication between a computer and peripheral devices such as hard disks, scanners, and CD-ROM drives. It is an electronic highway—called a *SCSI bus*—to which you can attach up to seven SCSI devices. SCSI is like the many other popular interface standards used on your PC—some of which you may recognize, such as the Serial, Parallel, and IDE interfaces.

SCSI host adapters act as a command center for the SCSI bus as it directs traffic and communications between SCSI devices and your PC. A SCSI host adapter usually has both an internal and an external connector—called *SCSI ports*. SCSI cables are used to connect SCSI devices to the SCSI bus and host adapter via a SCSI port (see Figure C-1). The following are the three main features of SCSI:

- Speed—It's fast.
- Intelligence—SCSI devices can communicate with each other without involving the CPU on your computer.
- Flexibility—SCSI devices can be anything from a printer to a CD-ROM drive.

FIGURE C-1

SCSI connectors



SCSI is a standard that works with a variety of computers, not just PCs. For example, you can connect the same SCSI hard drive to a PC, an Apple Macintosh, or an IBM mini-computer. Because of its universal acceptance, compatibility, and flexibility on multiple platforms, almost all new cutting edge technology devices are first produced with a SCSI interface: the largest, fastest hard drives are SCSI devices, as are the fastest CD-ROM drives—you get the picture. For these reasons, the SCSI port on the Pro Audio card is a valuable addition to your PC, as it opens up a world of options for peripherals.

SCSI Standards

Despite its popularity on other computers, SCSI has been slow in making inroads on the PC platform. Even though SCSI devices were supposed to be universal, the lack of a standard interface for the PC resulted in many incompatibilities. Many early SCSI host adapters only worked with some, but not all, SCSI peripherals. This resulted in the user having multiple SCSI host adapters in their PC for every SCSI peripheral. Needless to say, this negated one of the biggest advantages of the SCSI interface, namely, its ability to seamlessly connect up to seven peripherals to one host adapter.

The first SCSI standard, or SCSI-1, was actually based on an early standard first introduced as the Shugart Associates System Interface (SASI),

which was introduced by the company of the same name. The many incompatibilities among SCSI-1 devices resulted in an improved standard called *SCSI-2*. SCSI-2 primarily incorporates two major changes to the original SCSI standard: changes to the software commands that tell the SCSI device what to do; and changes to the hardware, or electrical parts, that determine the speed at which data can be exchanged on the SCSI bus.

SCSI-2 Common Command Set

The *SCSI-2 Common Command Set (CCS)* is a subset of SCSI commands that all SCSI-2-compliant devices are expected to understand. These commands allow SCSI devices to talk to each other in a common language. Most, if not all, SCSI peripheral manufacturers tout SCSI-2 CCS compatibility on all their recent designs.

Fast and Wide SCSI-2

The electrical changes made to SCSI resulted in the Fast SCSI-2 and Wide SCSI-2 standards. Both of these standards are optional and are not required for SCSI-2 CCS compliance.

Fast SCSI-2 doubles the maximum throughput (the amount of data that can be transferred) from 5MB/second to 10MB/second. This speed advantage is accomplished by simply changing the electrical timing and reducing the overhead specifications. Fast SCSI-2 does not require any changes to the SCSI cables. Currently, only hard drives are being manufactured to this standard.



TIP: *If you're buying a new SCSI hard drive soon, ask for Fast SCSI-2 compliance to get the best performance from the drive. You will also need a Fast SCSI-2 host adapter (which the Pro Audio is not) for maximum gain.*

Wide SCSI-2 specifies changes to both the electrical components and the physical connections between SCSI devices and SCSI host adapters. In the Wide SCSI-2 standard, the data path is increased from 8-bit to either 16-bit or 32-bit. Wide SCSI-2 is not very popular because it requires two cables and many changes to the components on the SCSI devices. Hence, Wide SCSI-2 devices cannot share the same SCSI host adapter as used by Fast SCSI-2 devices.

SCSI-3

A further enhanced standard dubbed SCSI-3 is in the works. This standard will require a new 68-pin cable (SCSI-2 uses a 50-pin cable for the most part) called the "P" cable. A new transfer protocol is supposed to emerge with SCSI-3 as well. It will be as fast as the combination of Wide and Fast SCSI-2 standards.

It is still too early to tell what will emerge from this new standard. There are even rumors that a new optical cable will be implemented with SCSI-3. Time will tell. For now, the SCSI interface on your Pro Audio works fine for the current generation of peripherals.

SCSI Address

Since up to seven devices can reside on a SCSI bus, the host adapter needs to be able to differentiate between them. That is why each SCSI device must have a *SCSI address*—also sometimes known as a SCSI ID. A unique SCSI address ensures that the information or instruction from the host adapter gets to the right device.

A SCSI address is a number between 0 and 7. The host adapter is usually automatically assigned the number 7 (including the one on your Pro Audio sound card). Since each device must have a unique address, this leaves the numbers 0 through 6. Whenever you add a device to a SCSI bus, you have to choose an address for it. This is done either by flipping a switch on the back of most external SCSI devices or changing jumper settings for most internal SCSI devices. You'll have to refer to the manual to see which method your device uses (yes, manuals do come in handy sometimes).



NOTE: *The SCSI ID is not related to any other address on the PC, such as memory address or port address. It is unique to the SCSI world.*

Termination

When you connect SCSI devices to each other (including the host adapter), you create a daisy chain. The devices at each end of this chain have to be terminated. Figure C-2 illustrates a SCSI daisy chain and shows where terminators must go.

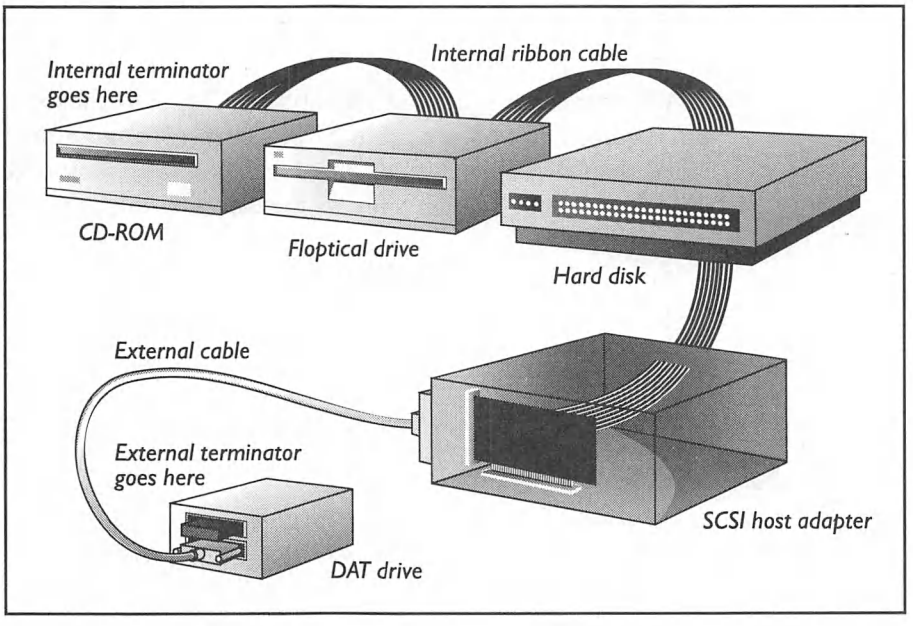


FIGURE C-2 When SCSI devices are chained together, there must be a terminator at each end

The best way to understand termination is to imagine the SCSI bus—which consists of daisy-chained devices—as a highway with a cul-de-sac on both ends. When data traveling on this highway reaches the end, it makes a U-turn on the cul-de-sac and creates confusion as it collides with other streams of data coming the other way. This can prevent any of your SCSI devices and your PC from working. Inserting *terminators,* or data absorbers in this case, at the ends prevent this data collision from happening. Terminators can also be compared with sound mufflers. Much like mufflers that absorb sound and prevent echoes when you speak in an empty room with bare walls, terminators absorb and prevent electrical echoes on a SCSI bus.

An external terminator looks like a SCSI plug, except it has no cable. Some devices come with internal termination that can be activated via a switch or jumper setting. Others use three or four resistors (electrical components that absorb electrical signals). Still others can automatically determine whether to terminate themselves or not.

The trick in termination is to ensure that the ends, and only the ends, of the SCSI bus are terminated. In other words, only the devices on the ends of the SCSI daisy chain should be terminated. Unfortunately, different devices use different types of termination. If you have several SCSI devices, you may have to juggle their order in the daisy chain around to find a configuration that works.

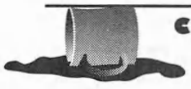
THE PRO AUDIO SCSI PORT

The Pro Audio sound card is designed to act as both a sound card and a SCSI host adapter. Media Vision's original intent in using a standard SCSI-1 interface on the Pro Audio is to allow you to connect almost any popular CD-ROM drive to your PC.

Even though the Pro Audio SCSI interface is only SCSI-1-compliant, all SCSI-2 devices work correctly with it. The only disadvantage is that you cannot use the SCSI-2 device at its maximum speed. However, except for hard drives, this is not a significant factor since the other peripherals do not tax the SCSI-1 standard. The rated maximum transfer rate for the SCSI port on the Pro Audio sound card is 690KB/second. Although this is too slow for newer SCSI hard drives, it is more than adequate for slower devices such as scanners and CD-ROM drives, and removable media drives such as floptical, SyQuest, and Bernoulli.

While you can hook up a SCSI hard drive to your Pro Audio SCSI port, we strongly advise against this. For one thing, the Pro Audio SCSI port is too slow, and will impede the performance of the hard drive. Perhaps most important of all, because you need to load a software driver in order to support a hard drive with the Pro Audio SCSI port, you cannot boot from this hard drive.

The Pro Audio has only one SCSI port, which can be used with internal SCSI devices. You can attach external SCSI devices to the Pro Audio, provided you purchase the optional external connector kit from Media Vision (P/N: 670-0003-01; $29 plus $7 shipping). If you want to connect internal and external SCSI devices to your Pro Audio at the same time, you must purchase a different cable apart from the above-mentioned external connector kit from Media Vision. All you need is an internal SCSI cable with three connectors. One end of the cable goes to the Pro Audio, the other end connects to the external bracket adapter. Internal SCSI devices then plug into a free connector on the internal cable. External SCSI devices are then plugged into the bracket adapter via an external SCSI cable (supplied with the external connector kit).



CAUTION: *The total length of all internal and/or external SCSI cables used for a SCSI daisy chain should not exceed 19 feet in length. Keep the cable between SCSI devices to three feet or less. Exceeding these limits is a sure way to make your SCSI devices undependable and unreliable, if they work at all.*

SCSIWORKS!

SCSIworks! is a set of software drivers from Trantor Systems, Ltd. that allows almost any popular SCSI device to be used on your PC via the Pro Audio SCSI port. It allows you to connect SCSI devices without having to add another SCSI host adapter to your PC, thus saving you not only additional money (for a host adapter), but also a slot in your computer. Also included in the package are a fairly comprehensive backup program, Tape Mate II, and a full-blown Windows version of the DOS CD player, Music Box, with CD database capabilities. Drivers for both DOS and OS/2 are included.

A subset of SCSIworks! is actually provided free by Media Vision. Specifically, the CD-ROM drivers that are provided with the Pro Audio sound card are actually the ones written by Trantor that are also part of the SCSIworks! package.



TIP: *An earlier version of SCSIworks! did not support Pro AudioStudio 16 or Pro AudioStudio 16XL. Contact Trantor Systems (address and phone number provided at the end of this chapter) to get an update that works with these newer cards.*

What SCSI Devices Can I Attach to the Pro Audio?

The list of SCSI devices compatible with SCSIworks! and the Pro Audio SCSI port is in constant flux and is growing. Below is a list of some of the devices that have been approved by Trantor as compatible:

- Virtually every available **SCSI hard drive** that supports parity
- **CD-ROM drives**, as listed in Chapter 11
- **Magneto-Optical Drives:** Fujitsu M2511A; IBM MD-3125A; Maxoptix Tahiti I and II; MOST RMD-5100-S and 5200; Olympus MOS-300E; Optimum 750; Panasonic LF-3004; Ricoh 3010, 5030E, 5030E2, and 5031E; Sharp JY7000; Sony SMO-301 and SMO-501; Teac OD-3000
- **Removable-Media Drive:** Bernoulli 45, 90, and 150; Insite Floptical; Iomega Floptical; Quadram QuadFLEXTRA; SyQuest 44 and 88; Teac 3 1/2" and 5 1/4" SCSI floppy drives (FD-55GS, FD-235JS, and FD-235HS)
- **Scanners:** Hewlett-Packard ScanJet Series, including the IIC and IIP

- **SCSI Tape Drives:** Archive Python, Viper 2125S, 2150S, and 2060S; Exabyte EXB8200, EXB8200SX, and EXB8500; Hewlett-Packard 35350A, 34570A, 35480; JVC 4mm DAT; RByte RB100; Sankyo CP1000SE, CD150SE, and CD525SE; Sony 4mm DAT; Tandberg TDC3600, TDC3800, and TDC4100; Teac MT-2ST; WangDAT 1300 and 2600; Wangtek 6130HS, 6200HS, E5150ES, and 5525ES; YE-Data YD-7101 and YD-7106

Introduction to ASPI

SCSI standards define the way SCSI devices communicate, but they neglected to define a software interface—a way for applications like your word processor to access a SCSI device. Two standards currently dominate the PC world as far as a standard software interface is concerned. These two protocols are called Advanced SCSI Programming Interface (ASPI) and Common Access Method (CAM).

SCSIworks! supports the ASPI protocol. ASPI is a software SCSI protocol originally proposed by Adaptec (which, incidentally, owns Trantor Systems). The idea behind ASPI was to simply create a "black box" software interface that would allow programmers to access SCSI devices via any SCSI host adapter without actually having to know the exact commands for the particular host adapter. Since every host adapter has a different programming language, ASPI is like a SCSI language translator. The concept is pretty similar to what a printer or video driver does for Windows.



NOTE: *You can learn more about software drivers and their functions in Chapter 3.*

Compatibility between SCSI software, interface and various SCSI devices has been a source of headaches for many programmers and users alike. This has been greatly alleviated as ASPI continues to be widely adopted by manufacturers. ASPI has gained the largest acceptance among PC users, whereas CAM, which was first introduced by Future Domain, is a distant second. CAM, however, has several enhancements that are useful in advanced operating systems like OS/2 that are not present in ASPI. In the future, CAM may become more popular, or ASPI will be expanded to include some of these features.

How Does ASPI Work?

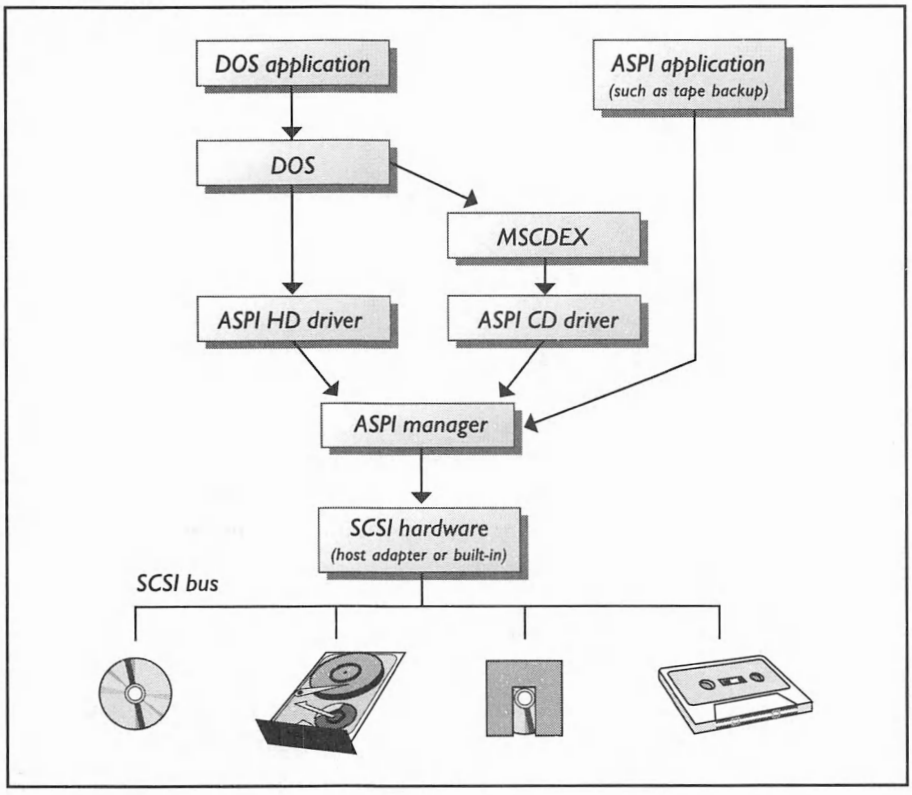
ASPI works in two parts. The first involves software that communicates in the ASPI command language. The second is the ASPI manager, which

translates ASPI commands from ASPI-speaking software to SCSI commands for the host adapter (see Figure C-3).

As far as the ASPI-compatible program is concerned, all SCSI host adapters and devices connected to your PC work the same way. These programs merely issue commands in ASPI and leave it up to the ASPI manager to translate them into appropriate commands (in our case, commands for the Pro Audio SCSI port). ASPI compatibility is not possible without an ASPI manager. Tape Mate II is an example of an ASPI-compatible program.

SCSIworks! essentially provides an ASPI manager for your Pro Audio SCSI port. Therefore, any ASPI-compatible software works with the SCSI devices connected to your Pro Audio sound card when you use SCSIworks! ASPI-compliant drivers. Together, the SCSI and ASPI standards go a long way in providing seamless integration of various peripheral devices to your PC using the SCSI port on your Pro Audio.

FIGURE C-3
A sample ASPI interface system



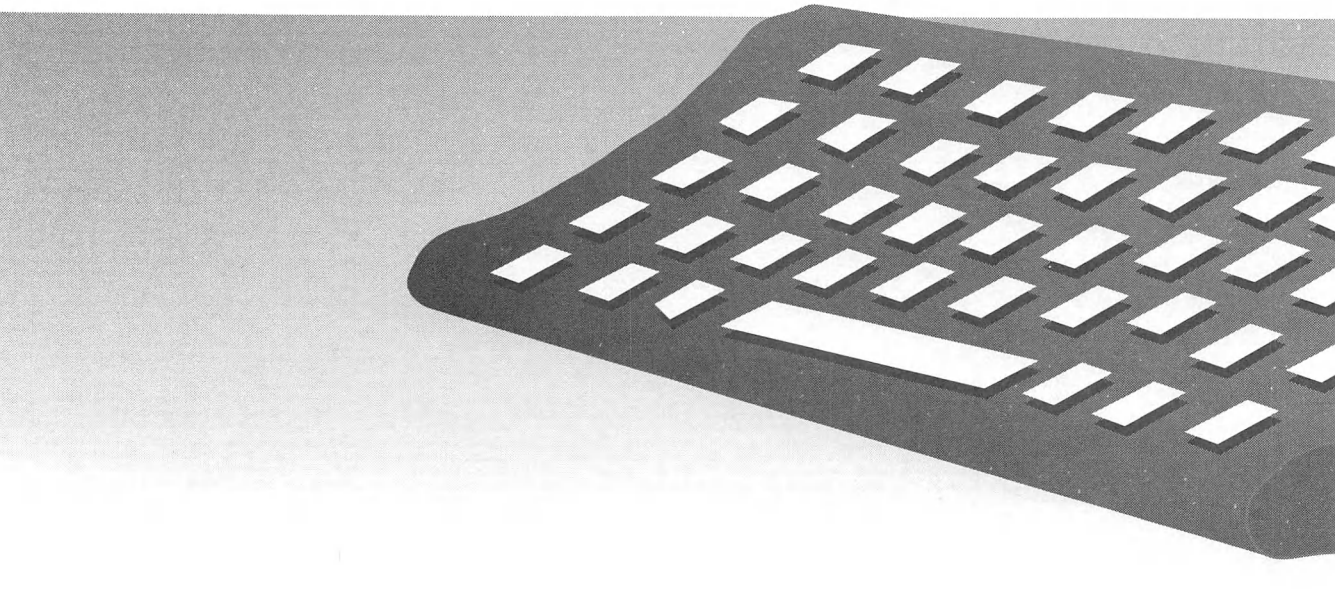
Technical Specifications

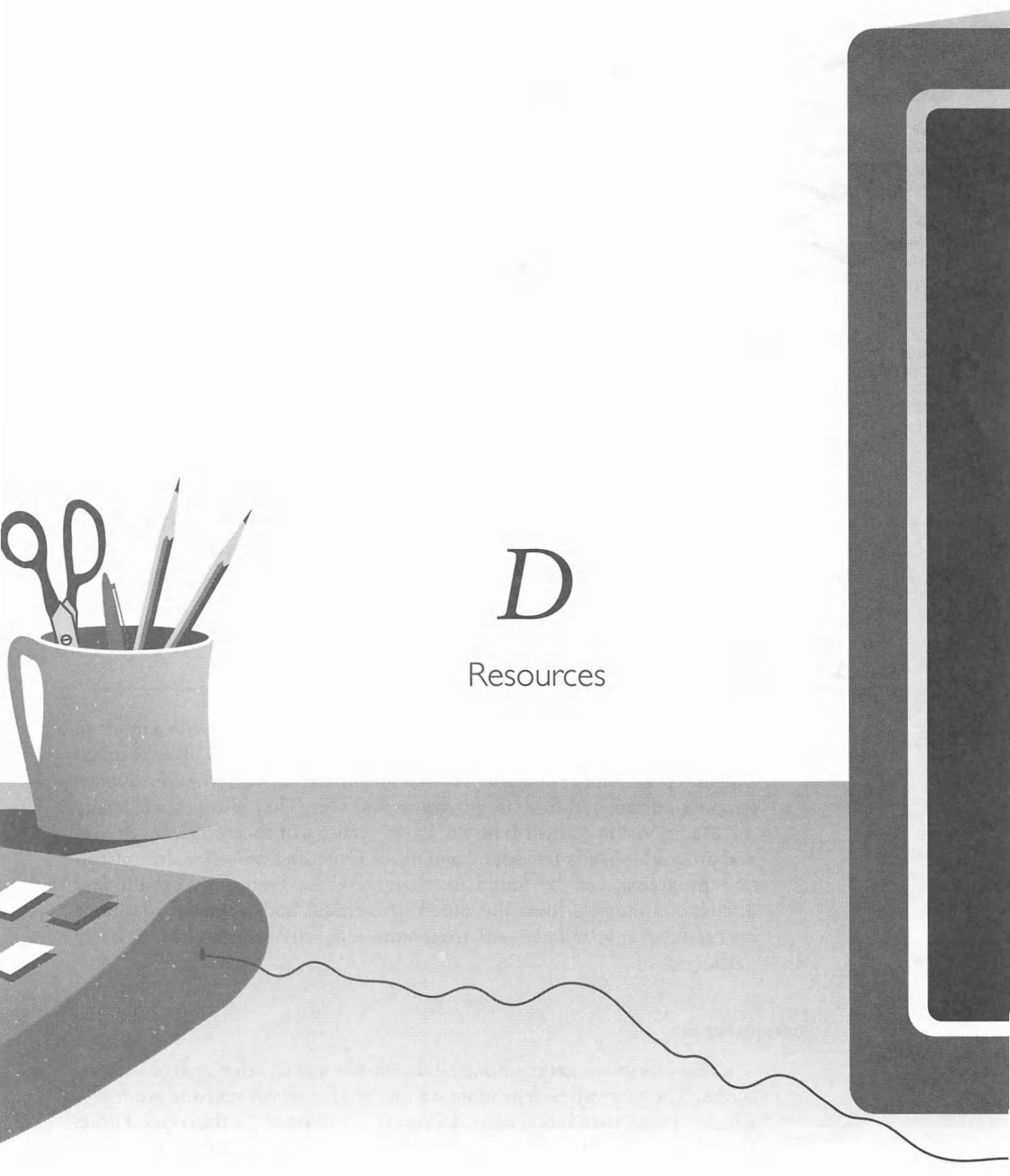
Some of you may have concerns about SCSIworks! disk and memory usage. Fully installed, SCSIworks! occupies approximately 2MB of hard drive space. The ASPI manager takes up about 7KB, the hard disk driver uses about 12KB, the CD driver requires around 10KB, and the scanner driver occupies approximately 3KB. All of the drivers can be loaded into high memory to conserve base memory. In addition, don't forget the requisite MSCDEX driver for CD-ROM drives that eat up at least another 20KB of memory.

Source

SCSIworks! retails at $89.95, but is available to all Pro Audio users for $59.95 direct from Trantor. Trantor can be reached at the following address:

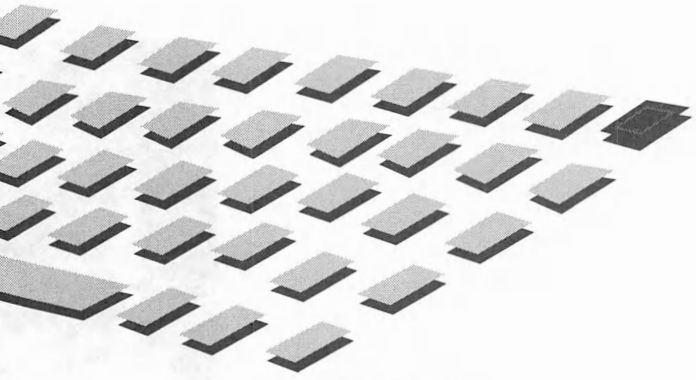
Trantor Systems, Ltd.
5415 Randall Place
Fremont, CA 94538-3151
(800) TRANTOR or (800) 872-6867
(510) 770-1400
(510) 770-9910 Fax





D

Resources



THIS Appendix will describe several invaluable resources for all users of Media Vision sound cards. If you have a modem, you'll undoubtedly want to look at the first section, "On-Line Services." Next, check out some of the listed magazines for the latest coverage of the PC hardware and software markets. Later in the chapter you'll find addresses and phone numbers for several important PC sound- and music-related organizations. Finally, we'll briefly describe some of the special resources available for those of you who are interested in programming for the Media Vision sound cards.

ON-LINE SERVICES

Modems open up a whole new world for PC users. With a modem, you can dial up a variety of electronic bulletin board systems (BBS) through a regular phone line. These BBS's offer a forum that allows Pro Audio owners to communicate and to share programs and files. They also provide a way for Media Vision to distribute the latest versions of their software drivers and programs. Many free sound and music programs, as well as demonstration programs, can be found on these services. Frequently, you'll find discussions ranging from the purely theoretical and technical to simple instructions for installation and troubleshooting, all of which you may freely participate in.

CompuServe

CompuServe is a giant among all the on-line services that charge a fee for access. The rate varies depending on the baud rate. All uploads are free—which is to say that during uploads, you're not charged for the connect time. CompuServe can be accessed locally in many cities and countries. It features many special interest forums where users can communicate via electronic

mail, as well as downloading and exchanging files. Some forums of interest that you'll find on CompuServe include:

- MEDIAVISION This forum is monitored daily by Media Vision. You'll find the latest drivers in this forum, and you'll be able to contact many other fellow PAS users (including the authors).
- MIDIFORUM The MIDI forum is where you'll find hundreds of MIDI files that you can download and play on your PAS. If you've composed a song, upload it here to share it with other music enthusiasts.
- GAMAPUB and GAMBPUB Many major game publishers are represented on-line in these forums. This is the best place to look for the latest patches and technical support for some of your favorite games, and to find out when brand new games will be released. These forums also provide a means for you to give suggestions and feedback directly to the publishers. You may run into a few game designers and programmers here as well.
- FSFORUM This forum is dedicated to flight simulator fanatics; you'll find many tips and thoughts being shared here. Add-on utilities for popular flight simulators like Falcon 3.0, Flight Simulator, and even X-Wing are offered in the forum's file libraries. General advice on flight simulation equipment and discussions about tactics can also be found in abundance here.
- SPRTSIM If you want to get into a league, this is the forum for you. It concentrates on the numerous sports simulations and games available for the PC, including Links and Front Page Sports Football.
- GAMERS If you need hints for an adventure or role-playing game, you can find them here. You can download a number of hint files, as well as complete game solutions for some of the latest PC games, from this forum.

To access any of the above forums, just type GO followed by the forum name (as listed above) at any CompuServe prompt. For example, to get to the Media Vision forum, just type:

```
GO MEDIAVISION
```

CompuServe is one of our favorite hangouts, so feel free to contact us via electronic mail on CompuServe with your problems, thoughts, and ram-

blings. (You'll find our CompuServe address in the Introduction.) You can purchase a CompuServe starter kit from most software or computer stores.

If you find yourself getting addicted to CompuServe, you'll incur some rather large monthly phone bills for supporting your habit. Several automatic access programs will help you become more efficient when accessing this service. For one thing, these programs allow you to read and compose messages off-line. This is accomplished by quickly downloading the messages, then hanging up to limit the on-line charges. After you've read your incoming messages and composed new ones of your own, the program can again quickly post the messages without your intervention. TAPCIS is one such program; you'll find it in the forum of the same name (GO TAPCIS). OzCIS is another favorite (GO IBMCOM) among heavy CompuServe users.

Call CompuServe Customer Service at (800) 848-8990 for more information.

Internet

If you're a real BBS junkie, you've probably already downloaded every audio goodie from Media Vision's BBS, CompuServe, and a half-dozen other favorite sources. None of these services can boast the millions of members that can be found on Internet. Internet was originally created by the Pentagon for connecting military and government Research and Development centers. Since being opened up to the public, it has expanded to 137 countries, and is a favorite in the former Soviet Union. Internet is fundamentally different than CompuServe, America Online, and the typical BBS service where the information essentially resides in one place. Internet is much more than a BBS. With an estimated 17 million users it's undoubtedly the biggest international computer network, enabling desktop computers around the world to send electronic mail, exchange programs and data, and access commercial and academic databases throughout the world.

Internet is an excellent resource for tapping into state-of-the-art activity. Best of all, you can access Internet from many local BBS's, and many times, there is no usage cost involved. You can read through the message traffic where technical gurus are always exchanging helpful comments on how to get their sound cards working in new environments, such as Windows NT and OS 2.1, and resolving the most esoteric sound card technical problems. You can also scour the network for audio files and new sound programs. For example, you can download .WAV files from the newsgroup for sound files that's located at "alt.binaries.sounds.misc". Internet is massive, to say the least. You'll want to check your local bookstore for one of the new books that will guide you through it.

Media Vision's BBS

Both end-users and developers can access the latest technical information and software updates through Media Vision's BBS, and exchange messages with the SYSOPs. It's supported 24 hours a day, 7 days a week, and can be accessed with the following numbers:

(510) 770-0968 up to 14,400 baud access (MNP Level 5)
(510) 770-0527 up to 14,400 baud access (MNP Level 5)

The communications protocol is 8 data bits, no parity, and 1 stop bit. This BBS is a virtual candy store; all manner of MOD files and the latest drivers can be found here.



NOTE: *Files found on most BBS's are usually compressed with PKZIP, a data compression program. The PKUNZIP program required for decompressing "zipped" files is available on the Media Vision BBS.*

MAGAZINES

Magazines are a good way to stay informed about the current state of the industry, as well as the latest PC hardware and software products.

General Purpose Magazines

Byte Magazine by McGraw-Hill, Inc. is one of the most respected in the industry for accurate, unbiased coverage of computer products. This monthly magazine is the one to read for finding out about the latest in applications of computer technology. It provides thoroughly researched, well-written articles on the leading edge of personal computer technology.

PC Magazine is a biweekly magazine published by Ziff-Davis Publishing Company. *PC Magazine* is well-known for its massive comparison tests of both hardware and software. In this regard, it is unsurpassed.

Game Magazines

Computer Gaming World is the oldest widely distributed publication of its type. It is a monthly publication that is part of the Ziff-Davis Publishing family. *Computer Gaming World* reviews the latest PC games, features articles that teach winning strategies for them, and previews upcoming games.

Computer Games Strategy Plus is a monthly publication that is fairly new in comparison to *Computer Gaming World,* but provides equally informative, high-quality game reviews. *Strategy Plus* is a good source for articles that will help you play some of the latest, hottest games.

IMPORTANT ORGANIZATIONS

The following organizations are important resources for additional information:

International MIDI Association
5316 West 57th Street
Los Angeles, CA 90056
(213) 649-6434

The International MIDI Association is the official source for MIDI information, including technical bulletins and books on MIDI. The IMA is a consortium of educational institutions, manufacturers, retail stores, musicians, and technical personnel involved in all facets of MIDI. Individuals can join the association for a modest fee.

Multimedia PC Marketing Council
1730 M Street, NW
Washington, DC 20036
(202) 331-0494

The Multimedia PC Marketing Council is the owner of the MPC standards. They also administer the standards by putting related products through a testing procedure before issuing MPC certification. You can contact them to obtain the actual technical specifications for the MPC standards, or for a colorful catalog of multimedia software.

MEDIA VISION DEVELOPER'S TOOLKITS AND CONFERENCES

Media Vision provides a variety of resources for those of you planning to develop a professional program using the Media Vision sound cards. Special conferences are held each year for developers, and you can also obtain source code from Media Vision for a nominal fee.

Computer Game Developer's Conference

Every year, a 3- to 4-day conference for computer game developers is held in the San Francisco Bay Area. It's been going on for eleven years, and it doubles in size each year. To get more information, contact Ms. Robinson at (408) 662-0536.

Media Vision Developer's Conference

Media Vision conducts a one-day conference for software developers on the day following the end of the Computer Game Developer's Conference. In 1993, there were approximately 225 attendees. The price is reasonable; the fee for 1993 was just $250.

Media Vision Developer's Kits

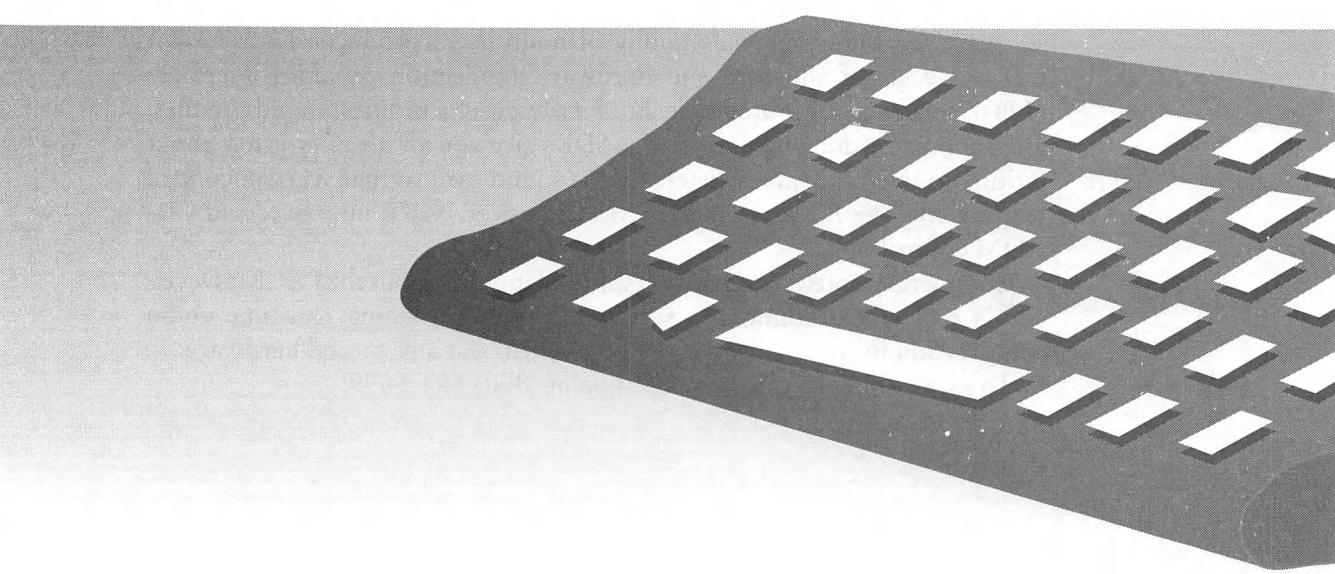
If you program in C, whether as a professional or a hobbyist, Media Vision has the tools for you. Media Vision sells the following three software developer kits (SDKs) for just $25 each:

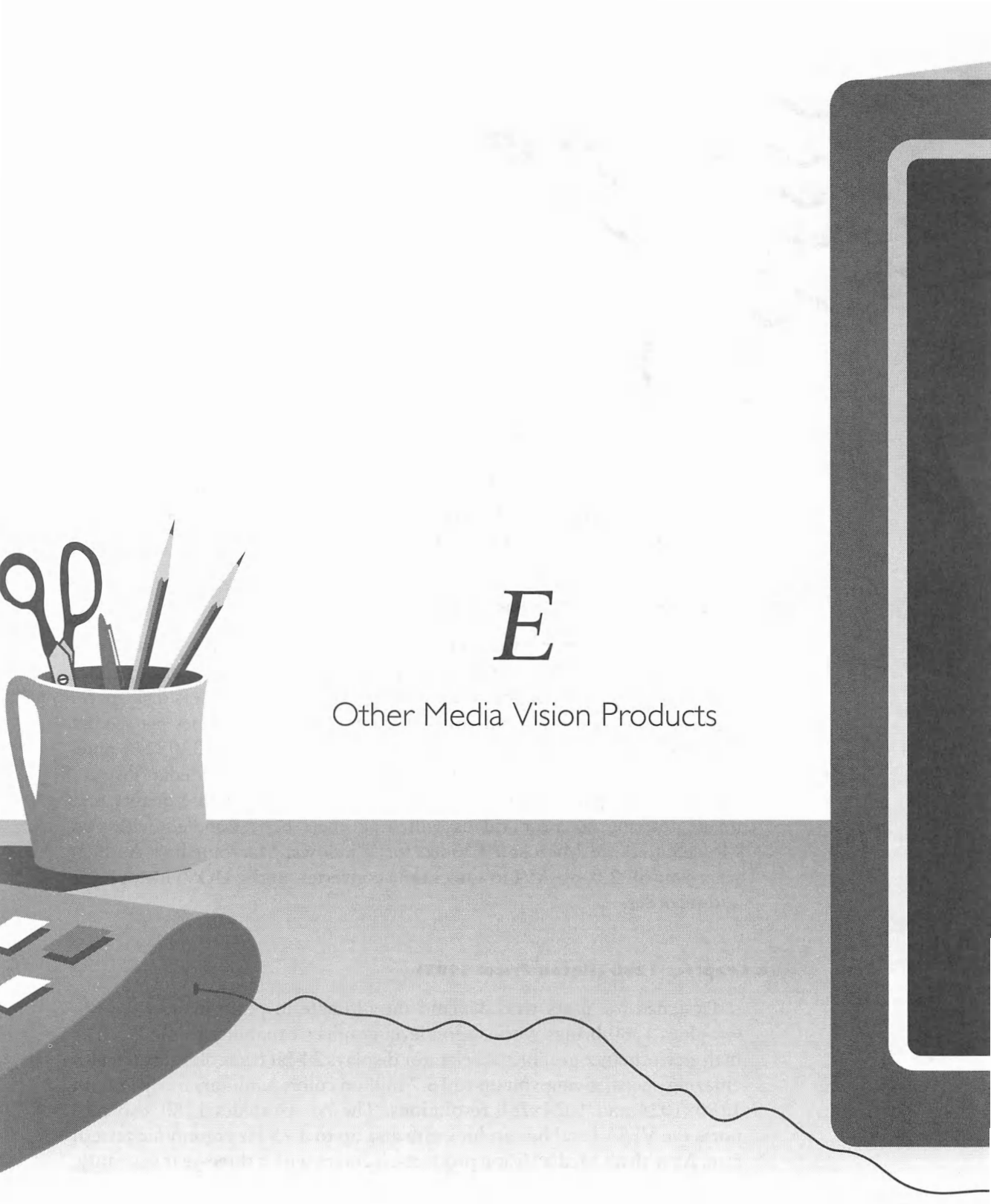
- Pro AudioSpectrum 16 SDK (Microsoft C version; disk included).
- Pro AudioSpectrum 16 SDK (Borland C version; disk included).
- Thunder Board SDK (no disk; code listings only).

SDKs make it quick and easy for application software developers to create software for Media Vision's family of multimedia products. Each toolkit includes a set of software and hardware application program interfaces (APIs), consisting of source code, header files, useful utilities, sound clip files, and supporting documentation. The SDKs give you all the nitty-gritty about writing to the hardware registers on the sound card so that you can control features like the PCM circuitry, FM synthesizer, MIDI interface, and CD-ROM control.

Commercial software developers should inquire about the PACKit Developer's Kit, which contains a software library for doing real-time audio compression in stereo, at up to 44.1KHz, without any special hardware.

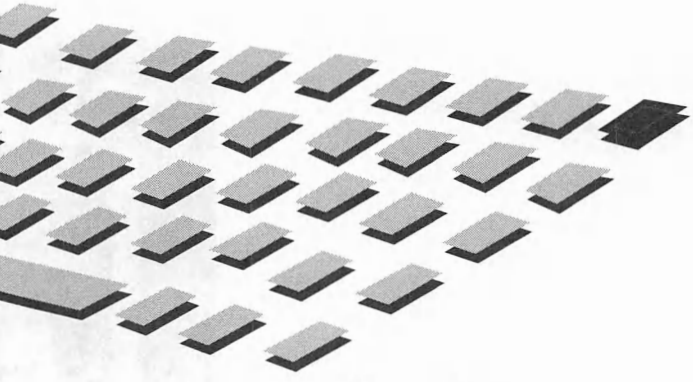
To order an SDK, call Media Vision at (800) 684-6699.





E

Other Media Vision Products



MEDIA Vision's goal is to popularize multimedia by providing multimedia products at affordable prices. Towards that end, Media Vision designs, produces, and markets not only sound cards for the PC, but also video add-in cards for the PC and sound cards for the Macintosh. Some of these other products are described in this appendix.

Pro MovieStudio (Retail Price: $449)

Pro MovieStudio provides everything you need to easily capture and compress digital video from your camcorder, VCR, laser disc, or any other NTSC, PAL, or SECAM source, faster than ever, and using less disk space. You can compress videos on your PC in real time at 30 frames per second in a 160×120 pixel window, or 15 frames per second in a 320×240 pixel window. It comes complete with powerful features like Media Vision's Advanced Imaging Control, providing adjustments for picture quality and image filtering so your videos will look their best. Bundled with Pro MovieStudio are Microsoft's Video for Windows, Macromedia's Authorware Star SE 2.0, an AVI to Quicktime converter, and a DOS video player and recorder.

Pro Graphics 1280 (Retail Price: $995)

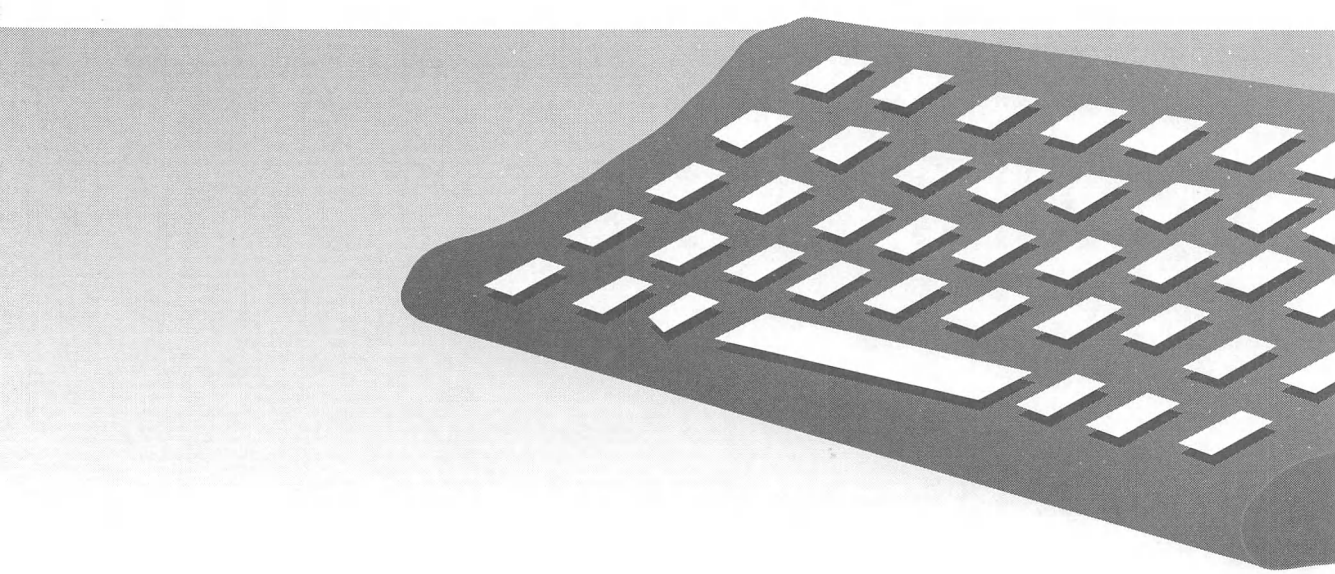
Designed for users who demand the ultimate in performance, the Pro Graphics 1280 brings workstation level graphics capability to the PC. The high-performance graphics accelerator displays 24-bit true color images with amazing speed, giving you up to 16.7 million colors simultaneously at both 1280×1024 and 1024×768 resolutions. The Pro Graphics 1280 also supports the VESA local bus architecture and up to a 75 Hz ergonomic refresh rate. As with all Media Vision products, it comes with a three-year warranty.

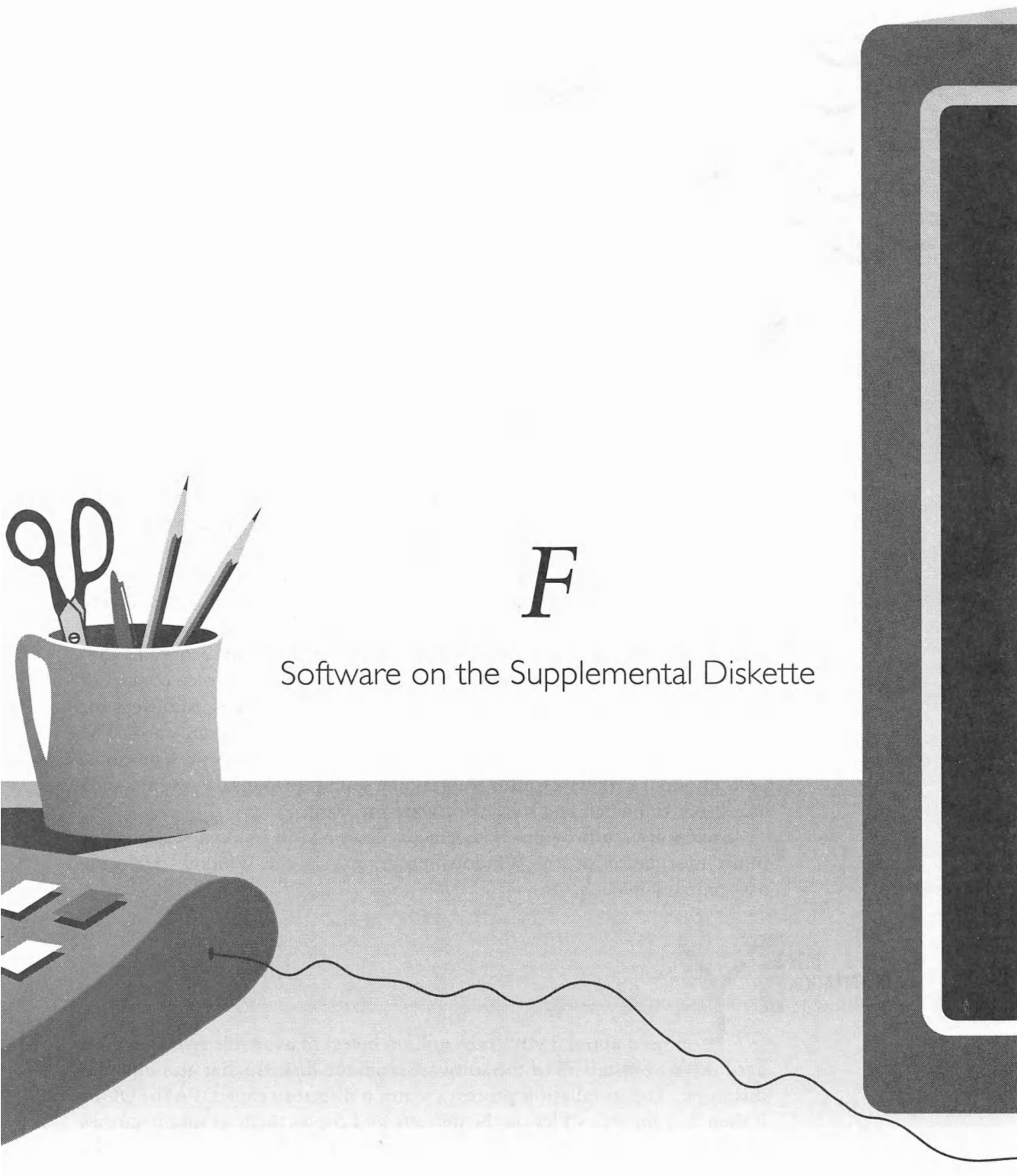
Pro AudioSpectrum 16 Macintosh (Retail Price LC Bus: $395; NuBus: $495)

The Pro AudioSpectrum 16 for the Macintosh is the state-of-the-art audio enhancement card for Macintosh computers. Available in LC and NuBus configurations, this adapter delivers 16-bit stereo digital audio recording and playback at sample rates of up to 44.1 KHz, MIDI, a microphone, and a 4-channel professional quality software controllable input mixer. In addition, special shielding and innovative circuitry are combined to produce high-fidelity, low-noise audio. This sound card brings the equivalent features of the Pro AudioSpectrum 16 for the PC to the Macintosh environment.

CD-ROM Multimedia Kit for Macintosh (Retail Price: $899)

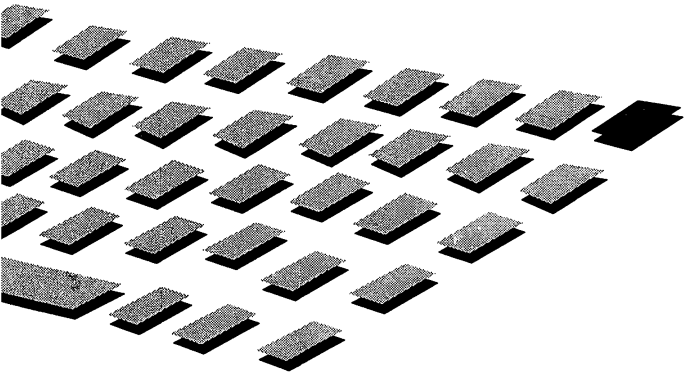
Media Vision's new CD-ROM Multimedia Kit includes the Sony CDU-501 double speed CD-ROM drive (300 Kb/sec transfer rate, 295 ms access time) and Labtec speakers. Bundled software includes: Out of this World and Battle Chess from Interplay, Compton's Multimedia Encyclopedia from Compton's New Media, and the CD-ROM Toolkit from FWB. It is compatible with Audio CD's, Photo CD's, and Apple's Quick Time.





F

Software on the Supplemental Diskette



THIS appendix provides installation instructions and helpful information about the software provided on the diskette that accompanies this book.

Almost exactly half the diskette is dedicated to DOS software that's a valuable addition to the software library for both DOS and Microsoft Windows users. The DOS software includes a preview version of Multimedia Kaleidescapes, an interactive music and image sculpture that showcases your computer's multimedia powers. In addition, there is a family of digital audio utility programs for making recordings and adding sounds to your PC. These programs are so rich in features that Appendix G, "Digital Audio Utility Programs," is wholly dedicated to their description.

The other half of the supplemental diskette is filled with programs that work with Microsoft Windows. These include InCube for voice command and control, MIDI JukeBox for playing MIDI and Wave files, MidiKeys for playing notes and auditioning instrument sounds on your sound card's FM synthesizer, Talking Slideshow for creating sound and picture presentations, and Whoop It Up!, which adds entertaining sounds to Windows events, such as a drum roll when you start a software program.

Each software program is succinctly described in its own section. For more information on the Windows programs, see the Windows Help file associated with each.

DISK INSTALLATION

You need about 3MB (three million bytes) of available space on your hard drive to install all of the software from the diskette that accompanies this book. The installation process creates a directory called \PA16BOOK. It then decompresses files on the diskette and copies them to subdirectories under \PA16BOOK. If you cannot perform the full installation, see the

"Partial Installation" section for details on how to select individual programs to install. The installation process also copies all the files for Appendix G, "Digital Audio Utility Programs," to your hard disk.



NOTE: *The installation procedure does not change your AUTOEXEC.BAT or CONFIG.SYS file, so you needn't be concerned about making backup copies of these before you begin the installation of the supplemental diskette. The final installation of the Windows programs will make, under your control, a Pro Audio 16 Book program group and a Talking Slideshow program group. If you like, you can create program groups with different names, or install the programs into an existing program group. For more background on how to do this, please consult your Microsoft Windows User's Guide.*

Full Installation

To install all the programs, place the diskette into your A: (or B:) floppy drive. You should be at the DOS prompt (C>).



NOTE: *If you're in Microsoft Windows, go to the Program Manager and select Exit from the File menu to return to DOS.*

Now run the INSTALL batch file on the diskette, selecting one of the commands from the following options:

- To install from floppy A: to hard drive C:, type **A:INSTALL A: C:** and then press ENTER.
- To install from floppy B: to hard drive C:, type: **B:INSTALL B: C:** and then press ENTER.
- To install from floppy A: to hard drive D:, type: **A:INSTALL A: D:** and then press ENTER.
- To install from floppy B: to hard drive D:, type: **B:INSTALL B: D:** and then press ENTER.

  You'll be prompted several times to press any key to continue.



NOTE: *You must include the colon (:) after the drive letter.*

If you run only DOS on your machine, then once the batch file finishes, you're done with the installation. If you run Microsoft Windows, your next step is to finish the installation of the Windows programs on the diskette. The INSTALL batch file tells you how to complete the Windows installation; this information is duplicated in the following procedure.

From your Microsoft Windows Program Manager, create a program group by following these steps:

1. Select New from the File menu.
2. Select Program Group, and then click OK.
3. Type **Pro Audio 16 Book** in the Description field.
4. Click OK.

From this new program group, create the program items for each of the files listed below, following these steps:

1. Select New from the File menu.
2. Click OK (program item is already selected).
3. Select Browse. (If you don't see the Browse button, you're in the File Manager.)
4. Navigate to each filename below, double-click them, then click OK:

   \PA16BOOK\IN3\IN3DEMO.EXE
   \PA16BOOK\MIDIKEYS\MIDIKEYS.EXE
   \PA16BOOK\MJUKEBOX\MIDIJB.EXE
   \PA16BOOK\WHOOP\WHOOP.EXE

Talking Slideshow has its own installation program. From your Microsoft Windows Program Manager, perform the following steps:

1. Select Run from the File menu.
2. Click Browse.
3. Navigate to the filename below, double-click it, then click OK:

   \PA16BOOK\TALKSHOW\INSTALL.EXE

   You now see the Talking Slideshow installation screen. If you accept the suggested values (which we recommend), the installation procedure creates a program group called Talking Slideshow that contains this one program only. Click Install to begin the installation. The Install screen of Talking Slide show will notify you when the procedure is completed.

4. Click OK and you will see the Talking Slideshow program group. Your Windows program installation is now complete.

Partial Installation

You can install the software onto the hard disk without running the installation program. A partial installation is necessary if any of the following situations apply to you:

- You lack 3MB available space on your hard drive.
- You wish to copy the files to a directory other than \PA16BOOK.
- You already have a directory called \PA16BOOK (the INSTALL batch file does not copy files to the directory \PA16BOOK if it already exists).

The file FILELIST.TXT (FILELIST.WRI) on the diskette lists the software provided with the name of the self-extracting file that contains each program. Suppose you want to make a fresh copy of the Digital Audio Utility Programs that are provided in the self-extracting file PA16UTIL.EXE. Create a directory on your hard drive (if one doesn't already exist for these files). Switch to that directory and then run PA16UTIL.EXE. PA16UTIL then copies the files to your directory on the hard drive.

Let's say you've put the diskette into the A: drive, and you wish to copy the files in PA16UTIL.EXE to a directory called \PA16UTIL that you've just created on your C: drive. Follow these instructions:

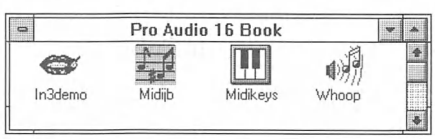
1. Type **C:** and then press ENTER.
2. Type **CD\PA16UTIL** and then press ENTER.
3. Type **A:PA16UTIL.EXE** and then press ENTER.



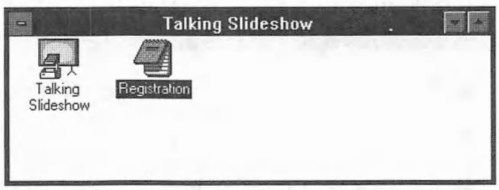
NOTE: *Refer to your DOS manual for more assistance with creating directories or moving into and out of them.*

USING THE SOFTWARE

Once the Windows software is installed on your hard drive, you will see the Pro Audio 16 Book program group (shown here) with icons for InCube, MIDI JukeBox, MidiKeys, and Whoop It Up!



If you followed the standard installation for the Talking Slideshow in the previous section, you will also see a program group (shown here) for that program.



InCube Voice Command by Command Corporation, Inc.

InCube is a relatively new speech product for the PC, having first made its debut with Sun workstations. A demonstration version of InCube is provided on the disk, and it has a 14-command lexicon for predefined commands, including commands for loading Media Vision Pocket Mixer and Pocket CD as well as Microsoft Windows Clock and Calendar and other Windows accessory programs. With the full version of InCube you can add new commands, have 75 active commands at any one time, and switch to another set of 75 commands at any time by giving the Open command.



TIP: *To read more about speech recognition and voice command and control, see Chapter 7, "Speech." There you'll find chapter has an extensive description of ExecuVoice, the speech program shipped by Media Vision as part of the Pro Studio PowerPak.*

InCube is different in several respects from ExecuVoice. ExecuVoice is speaker-independent, while InCube is speaker-dependent. You can use ExecuVoice without any training (although the accuracy improves after training), but you must train InCube before it can recognize your commands.

Starting Incube

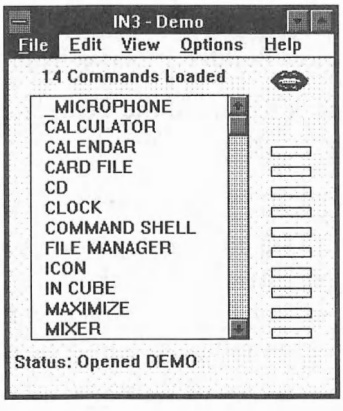
To load InCube, click the In3demo icon in the Pro Audio 16 Book program group. You will see the InCube window, shown in Figure F-1.

Getting InCube Ready: Train the Commands

Success in training InCube requires that the mixer, either Pro Mixer or Pocket Mixer, be set correctly. Incube gives you an "Audio Input Level Is Too Low" message if either the microphone source is too low or your speech is too soft for successful training. Figure F-2 shows Pocket Mixer with the

FIGURE F-1

InCube



correct settings. The microphone source must be set to Record, and the microphone volume to about 75 percent of maximum. Note how the Pocket Recorder's recording monitor level (Mon Level) is set as low as possible. If the recording monitor level is too high, InCube may prove over-sensitive, and may even respond to the sound of your typing at the keyboard.



TIP: *If you're using Media Vision's Pocket Mixer, you can quickly set up your mixer by using the mixer setting file IN3.MIX that's found in your \PA16BOOK\IN3 directory. From Pocket Mixer, select Open in the File menu and navigate your way to this directory. Once this mixer setting file is loaded, the mixer resembles the screen shown in Figure F-2.*

These settings may result in too much feedback (the microphone picking up your voice coming through the speakers) for your sound card environment. If you hear distortion or a ringing sound, or you're having problems with voice command recognition, reduce the master volume. If you turn it down completely, you have the best setting for training but you miss InCube's verbal message "InCube is ready" at the end of the training procedure.

FIGURE F-2

Pocket Mixer setup for InCube training



To train InCube, follow these steps:

1. Select Build Templates from the Edit menu.
2. Click Create in the Template box. (All should already be selected in the Selection box.)
3. Click the Begin button.
4. InCube now prompts you to pronounce the 14-command demonstration vocabulary. You must repeat these commands with a relatively strong voice, with the microphone relatively close to your mouth, while InCube is building the voice templates.

If InCube is satisfied with your response, it advances to the next command. If it is not satisfied, it issues the message "<command> not recognized," and the Pause button changes to a Resume button. When you're ready to proceed, you have to select the Resume button and repeat. Try again in a slightly louder voice while speaking closer to the microphone. Once all the commands are recorded successfully, InCube returns you to its main window and says "InCube is ready."

Saving the Voice Templates

If you're satisfied with how InCube has been trained, you should save the voice templates in a file with your initials. Select Save As from the File menu on the InCube menu bar. You can save a template for each person using InCube.



TIP: *You can later retrain InCube if you're dissatisfied with its accuracy. Select Build Templates from the Edit menu, then select Refine. You should experiment with a range of volume settings for the microphone as well as microphone placement to find the ideal combination. If you're having difficulty refining a command because InCube repeatedly rejects your attempt at refinement, select Create, rather than Refine, in the Build Templates dialog box to completely replace the previous voice template.*

Temporarily Disabling Voice Recognition

Once you've trained InCube, you'll see that the lips have turned from black to red, indicating that InCube is now listening for your commands. If you need to engage in a conversation while seated near your microphone, you should temporarily disable voice recognition. Say "microphone" to toggle InCube from on to off—the lips change color from red to black, and

you hear a distinctive beep. When set to off, the only command InCube responds to is "microphone." This one word wakes up InCube, causing it to issue two beeps. The lips turn red again, and InCube now responds to all of its preprogrammed voice commands.

Speaking to InCube

InCube features a recording level monitor on the right side of its window. At first glance, this monitor appears to be a stack of empty boxes. When you're speaking, the stack turns green beginning with the lowest box, roughly in proportion to the strength of your voice. Ideally, while you're speaking a few of the boxes are green, indicating that your voice is strong enough for recognition. Try to avoid speaking so loudly that the boxes at the top turn red. The red indicates too much volume that can lead to distortion, making voice recognition inaccurate.



TIP: *If strange things suddenly happen, such as the File Manager appears (one of InCube's commands) while you're typing away at the keyboard, you may have set the mixer's microphone level too high for InCube, leading to false events. Reduce the mixer's microphone level slightly until the problem goes away.*

Issuing Voice Commands

Test your new voice mastery over the computer by telling InCube to load the Pocket Mixer or Clock. Simply say "Pocket mixer" to open this application. Now make the Pocket Mixer disappear by saying "icon." This command reduces the active window (the one with the highlighted title bar, in this case, Pocket Mixer) to an icon. The next time you say "Pocket mixer" it pops up more quickly, because the program is already running. Try the same with the Notepad, Calendar, File Manager, and your other Windows applications listed in the InCube main window. To use the Pocket CD (which is slow to load the first time), say "CD."



NOTE: *If InCube can't launch your Pocket Mixer or Pocket CD application, but you know it's correctly recognizing your command (the command is echoed at the bottom of the InCube screen), you may have a problem with the PATH statement in your AUTOEXEC.BAT. Check that the path statement includes the directory where your Media Vision software, including PMIX.EXE and PKCD.EXE, is located.*

InCube responds to your commands even if InCube is hidden behind your other windows or is minimized to an icon. InCube is fast, so it acts on your

command almost as soon as you speak it. You'll discover that while you may need a fairly strong voice (or at least need to hold the microphone a few inches from your lips) to train InCube, it responds to commands that are spoken in a voice softer than during training. Chapter 7, "Speech," has tips for training ExecuVoice that are also relevant to InCube.



TIP: *If you're continuing to have problems with InCube, you may have problems due to background noise or microphone placement. To gain confidence with InCube (or another speech product with the same problem), train InCube with the microphone close to your lips and give it commands from the same position. When you give commands, try to use the same type of voice, spoken at roughly the same speed, that you used for training.*

About InCube

InCube has several advantages over competing packages. By focusing on a relatively small vocabulary in any one context (75 commands) it can have a higher accuracy in recognition. In addition, it is capable of picking out your command even if it is surrounded by "fluff" in the sentence. For example, if you say "please give me the clock" or "clock now" or "I want the clock" you get the same result—the Microsoft Windows Clock appears.

InCube uses fundamentally different—and simpler—technology than products like ExecuVoice. InCube doesn't match your voice against its templates based on the frequency components, the way ExecuVoice and many other large-vocabulary voice recognition systems do. InCube matches on overall energy at each point of time over the one or two seconds of your utterance. This approach makes InCube fast and relatively insensitive to voice changes, such as changes caused by a sore throat. InCube's simple and elegant technique isn't ideal for taking dictation, but it's a good match for voice command in which only a limited set of commands are relevant in any given situation.

There are two drawbacks to the InCube approach toward command and control. All the templates must be trained, which becomes tedious when you have hundreds of commands. The second drawback is sometimes an advantage: InCube recognizes only the voice it was trained for.

Multimedia Kaleidescapes by Masque Publishing

Kaleidescapes by Masque Publishing is a mesmerizing multimedia music and image sculpture created by computer artist John Ratcliffe and award-winning multimedia composer Rob Wallace. You'll be amazed by the

stunning 3-D images of objects floating in space, and you'll be soothed by the phenomenal electronic music. It's an interactive experience certain to give hours of pleasure. The opening screen is shown in Figure F-3.

This preview version of Kaleidescapes features two of the five realms that will be available when this product is sold in computer stores. The two realms are DesertScape and SkyScape. DesertScape actually shows desert, mountain, sky, and plant life scenes, while SkyScape is more true to its name, showing dramatic scenes of sky and sunlight with three-dimensional objects floating through space. The lifelike images demonstrate the power of fractal technology to realistically simulate—and help explain—mountain ranges, clouds, and leaves.

Running Kaleidescapes

Kaleidescapes is a DOS program run from the DOS command prompt. If you're running Microsoft Windows programs, you must quit Windows before running Kaleidescapes.

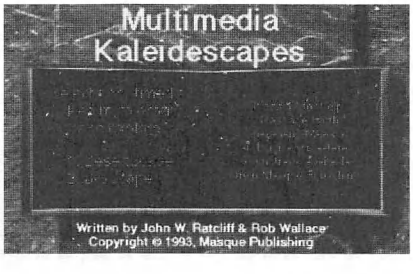


TIP: *To quit Windows, use* ALT-TAB *to switch to the Program Manager, select Exit from the File menu, then select Yes.*

When you're at the DOS prompt, follow these steps:

1. Switch to the \PA16BOOK directory by typing **CD\PA16BOOK** and then press ENTER.
2. Run the batch file that starts Kaleidescapes by typing **KESCAPES** and then press ENTER.

FIGURE F-3
Kaleidescapes opening screen



Customizing Kaleidescapes

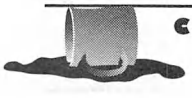
While running either of the two scenes, you can dramatically change its imagery. Press the H key to display a screen of instructions. Press SPACEBAR to return to the show.



TIP: *The file README.PRN in the \PA16BOOK\KESCAPES directory contains detailed instructions on using Kaleidescapes and interesting background information.*

Quitting Kaleidscapes

Press ESC to return to the opening screen. Press ESC again to see the credits. Press ESC again to return to the DOS prompt. Then reboot your machine before running Microsoft WIndows.



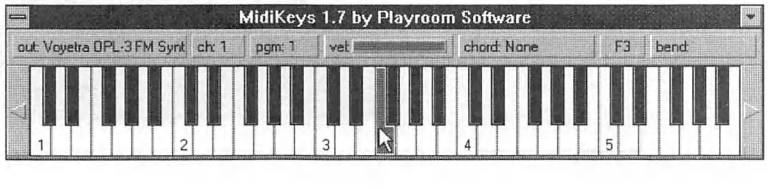
CAUTION: *Kaleidescapes clashes with the Microsoft Windows environment over the use of drivers. After running Kaleidescapes, you must reboot your machine (CTRL-ALT-DEL) before running Windows.*

MidiKeys, a Virtual MIDI Keyboard, by Playroom Software

MidiKeys is a screen representation of a synthesizer keyboard that can play notes on your PC's speaker, the synthesizer on your sound card, or on external MIDI synthesizers hooked up to your sound card. For most people it's the perfect educational toy for auditioning the instrument and special effect sounds built into a synthesizer, either the one on the sound card or an external one.

MidiKeys is also ideal for illustrating the impact of two important MIDI commands: pitch bend and the attack velocity for a note. These commands are hard to describe but easy to comprehend when heard. If you're deep into MIDI, MidiKeys is a valuable tool for setting up the MIDI Mapper, which is described in Chapter 8, "The Ins and Outs of MIDI."

When you select the MidiKeys icon from the Pro Audio 16 Book program group, you will see the keyboard appear:



Setting Up MidiKeys

When MidiKeys is run for the first time, it is set to play simple sounds only through your PC's internal speaker. To play instrument sounds generated by the FM synthesizer and to send the sound to your sound card speakers, click the Output (out:) device button at the top left and select "Voyetra OLP3 FM Synth." If this choice is not available, select the menu choice that's called "MVI Pro Audio" or something similar. If you selected the Voyetra OPL3 FM driver, the button should now resemble the one shown in the preceding illustration. MidiKeys remembers this setting. The sections that follow describe the main features of MidiKeys, accessible with buttons above the keyboard.

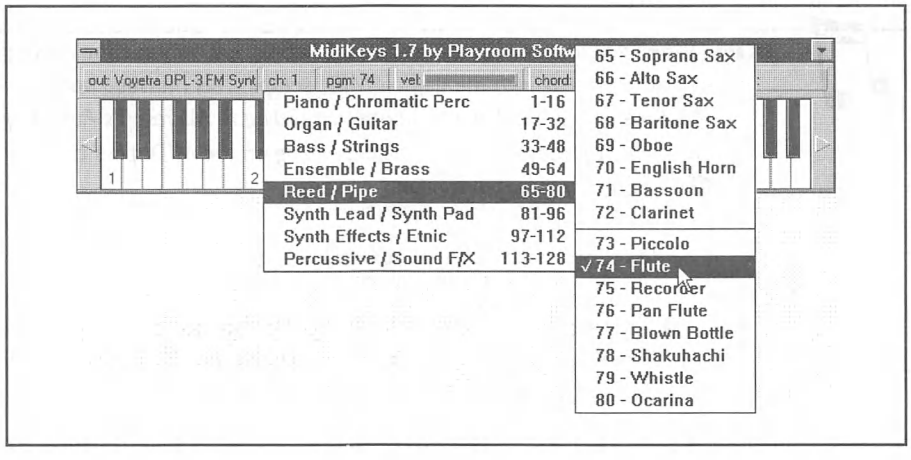
Change the Sound (Program Number)

Click the Program (pgm:) button and navigate to the submenu and instrument you want to audition. In Figure F-4 you can see how the flute sound is selected.

You can select among the 128 sounds defined by the General MIDI standard for instrument assignments (for a base-level synthesizer like the FM synthesizer on your sound card, a group of instruments may have the same or similar sound).

If you're controlling an external synthesizer, a Program Change message is sent to the FM synthesizer, telling it what instrument sound to play next.

FIGURE F-4 *Program (instrument) choices*





TIP: *Press PGUP and PGDN while clicking on the keyboard to audition all the instruments in sequential order. Each time you press the PGUP or PGDN key you advance to the next or previous instrument sound.*

Change the Note Velocity

MIDI keyboards transmit information on how hard the keys are pressed. This information is transmitted as part of a Note On message. To change the velocity, click the Velocity (vel:) button and select a value between 1 and 127. The bar on the Velocity button graphically shows the current velocity setting.

Change the Note Bend

You can slide the pitch of a sound by dragging the cursor to the left or right on the keyboard after you click and hold on a key. This bends the note, something that can't be done on a real keyboard, but which is a common technique for guitar players. Click the Bend (bend:) button to change the bend behavior.

MIDI JukeBox by Pocket-Sized Software

MIDI JukeBox is a handy program for playing a stack of MIDI and Wave files. You can have MIDI JukeBox play files once or loop back to the first after finishing the stack. Figure F-5 shows the JukeBox playing a MIDI file with several more still to play.



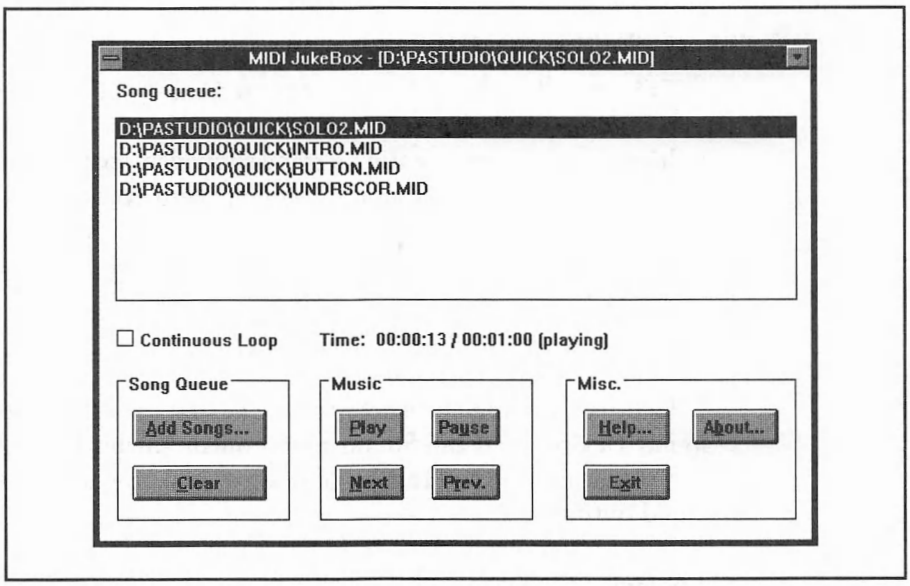
TIP: *When you load a MIDI file in MIDI JukeBox, you may see the message "This file may not play correctly with the default MIDI setup." This message appears when you add a MIDI file that hasn't been composed according to Microsoft's Authoring guidelines. It may play fine, or it may not play it all, depending on the MIDI file's channel assignments. See Chapter 8 for more information.*

Files can be stacked in several ways:

- The easiest way to add songs to the stack is to click the Add Songs button, then click a filename (or select a group of filenames), and then click OK.

FIGURE F-5

MIDI JukeBox



- The most direct way is to drag a file from the File Manager to the MIDI JukeBox.
- By configuring Windows to associate a MIDI (.MID) and/or Wave (.WAV) file with the MIDI JukeBox, whenever you double-click that file type in the File Manager, MIDI JukeBox appears with that file ready to play.

When Windows is first installed, it is set up to associate a file type (actually a file extension) with a specific program responsible for handling that file type. For example, if you're in the File Manager and double-click a file with the file extension .TXT, which implies that the file type is text file, Windows will automatically run the Notepad application and load the file you selected. You can do the same with .MID files by performing the following steps:

1. Go to the File Manager.
2. Press ALT, **F**, **A** (for File Associate).
3. Type **MID** in the Files With Extension field.
4. Type the MIDI JukeBox path (**C:\PA16BOOK\MJUKEBOX\MIDIJB.EXE**) in the Associate With field.
5. Click OK.

Talking Slideshow by Softline, Inc.

Talking Slideshow makes it a snap to create your own sound and picture presentation that runs under Microsoft Windows. Try your hand as a multimedia producer, creating a trade show demonstration or training tool. Or create a talking family album complete with every family member's voice and picture. Figure F-6 shows the slideshow window that appears on your screen when you select the Talking Slideshow icon.

Setting Up the Program

To direct Talking Slideshow to take advantage of your sound card, select Sound Device from the Sound menu on the menu bar. Click the Testing button to confirm that Talking Slideshow will now use your sound card for sound output.

Running Slideshow

Select Play from the File menu to play the four-screen sample presentation that comes with Talking Slideshow. Select Loop from the main menu to access the Loop dialog box. Here you specify the delay between pictures and whether the slide show is shown once or runs continuously.

Creating Your Own Slideshow

Talking Slideshow can present up to 100 slides. It displays .BMP picture files in order, 1.BMP followed by 2.BMP, and so forth. Each picture file can be accompanied by a Wave digital audio file. These files are given the names

FIGURE F-6
Talking Slideshow



SOUND1.WAV, SOUND2.WAV, and so forth, and correspond to the picture file with the same number. The digital audio files can be created with your Media Vision Pocket Recorder or the Windows Sound Recorder.



TIP: *To show more than four slides in a Slideshow, you must edit the TALK.INI initialization file (click on it from the File Manager). Add a Picturenn= line for each picture you want to add.*

There are several ways to create or convert images to the .BMP file format needed by Talking Slideshow. Many graphics programs allow you to convert between file types and save files as a standard Microsoft Windows .BMP file. A scanner is ideal for adding your own pictures. If you don't have a scanner, but you do have a fax/modem, you can ask a friend to fax a picture to your computer. First check whether your fax software can save a picture as a .BMP file. There are also numerous service bureaus and photo labs that can convert a photograph or slide to a .BMP file.



TIP: *Anything you can see on the screen you can include in a Slideshow. When you press the Windows* PRINT SCRN *key, a copy of the screen is copied to the Windows ClipBoard and can be viewed by running the ClipBoard application found in the Microsoft Windows Accessories group. Once an image has been placed in the ClipBoard, it can also be brought into the Paintbrush program by selecting Paste from the Paintbrush Edit menu.*

Whoop It Up! by Advanced Support Group, Inc.

Whoop It Up! turns any Windows 3.1 PC into an entertaining chatterbox that plays MIDI and Wave files whenever certain system and application program events occur. Figure F-7 shows the Whoop It Up! screen for attaching sound files to events. Whoop It Up! is special among this class of programs for its ability to attach MIDI music to events.

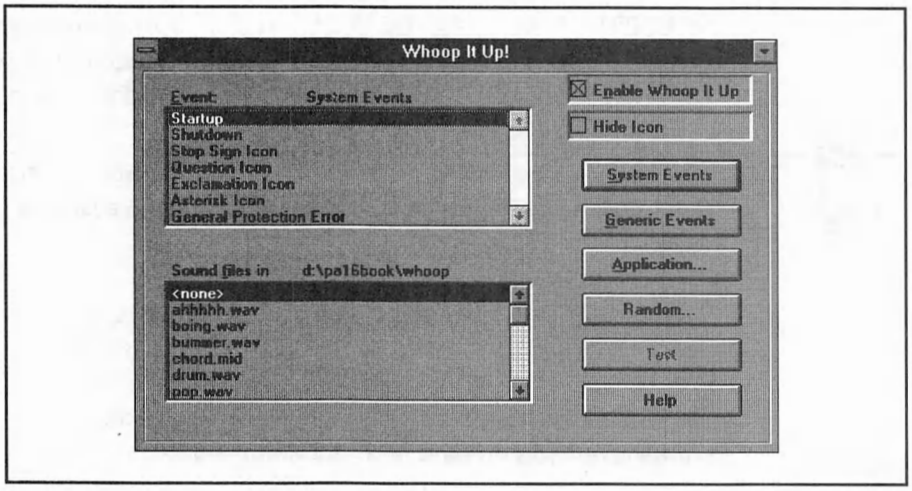
With Whoop It Up! you can perform the following tasks:

- Attach sounds to generic events, such as maximizing a window.
- Attach sounds to system events like Message Box icons.
- Define sound events for any application, playing a fanfare, for example, when you start your word processor. (You can define events of this type only with the registered version of Whoop It Up!)

After you match sound files to events, minimize Whoop It Up! to an icon. It will spring into action with wacky sounds whenever these events occur.

FIGURE F-7

Whoop It Up!



Contrary to what the program documentation says, you cannot attach a sound to Notepad. The Hide Icon option and Random Sounds feature have no effect in this demonstration product.



TIP: *Since Whoop It Up! improves on the usual Windows 3.1 sounds, you should turn off Windows sound events except for the default beep. Go to the Control Panel Sounds applet and select "<none>" for each system event, with the possible exception of the "tada" you hear when Windows starts and the "chimes" when Windows exits, which you've probably grown accustomed to hearing. Note that if a sound is enabled in the Control Panel, you may hear two sounds for some events: the one that Windows plays and the one that Whoop It Up! plays.*

THE SOFTWARE PUBLISHERS

Listed in this section are the addresses and phone numbers of the publishers whose products are described in this appendix. Some of the software on this disk is shareware, which means that the publishers ask you to provide a small monetary contribution if you like the product or if you'd like to receive a version that is richer in features. If you've found that a software program has become part of your computer routine, please register the software program.



TIP: *Check the back of the book for money-saving coupons on products from these publishers.*

Command Corp., Inc. (InCube)
3675 Crestwood Parkway
Duluth, GA 30136
(404) 925-7950
(404) 925-7924 (fax)
Demonstration product; $179 for fully functional retail version.

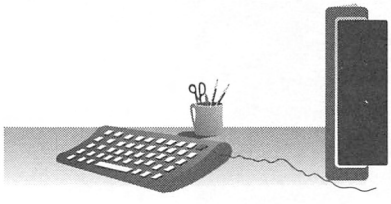
Masque Publishing (Kaleidescapes)
John Ratcliffe can be contacted electronically by CompuServe at 70253,3237.
Full version available at retail stores. The tentative name is Kaleidescapes or Multimedia Kaleidescapes, but this is likely to change. The retail version is similar to the one you have, except that it comes with five realms and plays audio CD tracks.

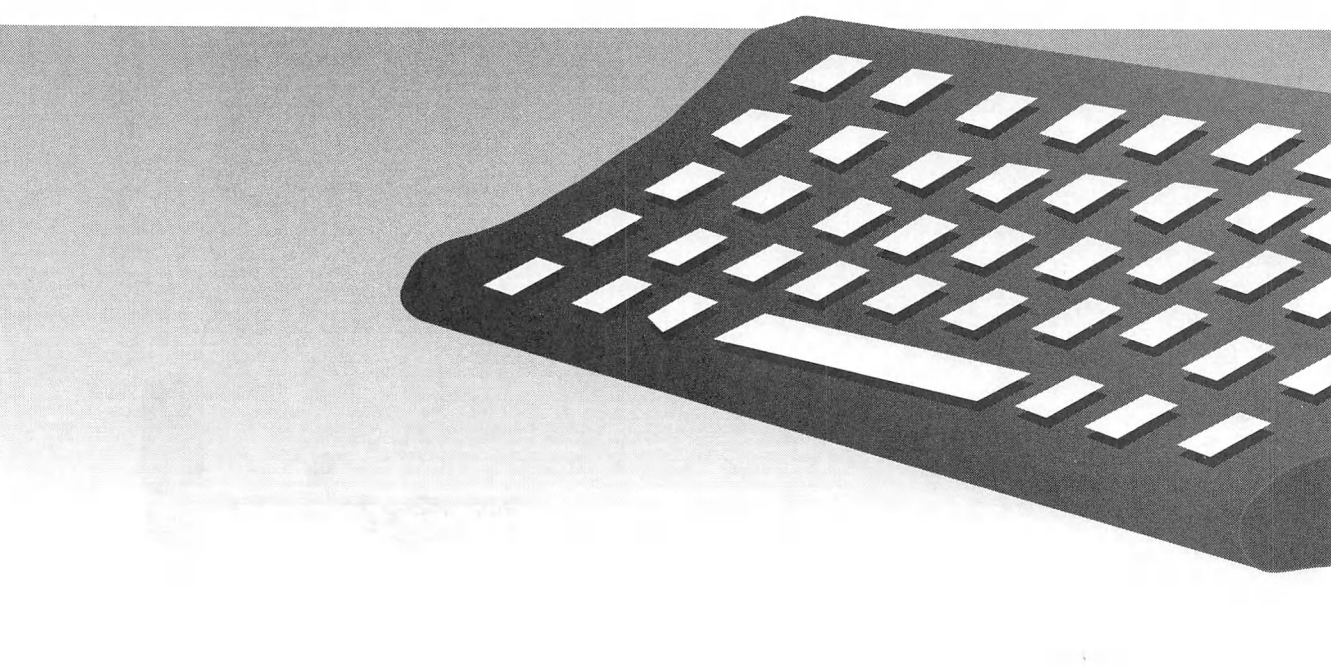
Playroom Software (MidiKeys)
7308-C East Independence, Suite 310
Charlotte, NC 28227
(704) 536-3093
Compuserve: 76702,1603
Playroom Software requests registration only; if you contribute $5 you receive the next version of MidiKeys and the next MIDI software product.

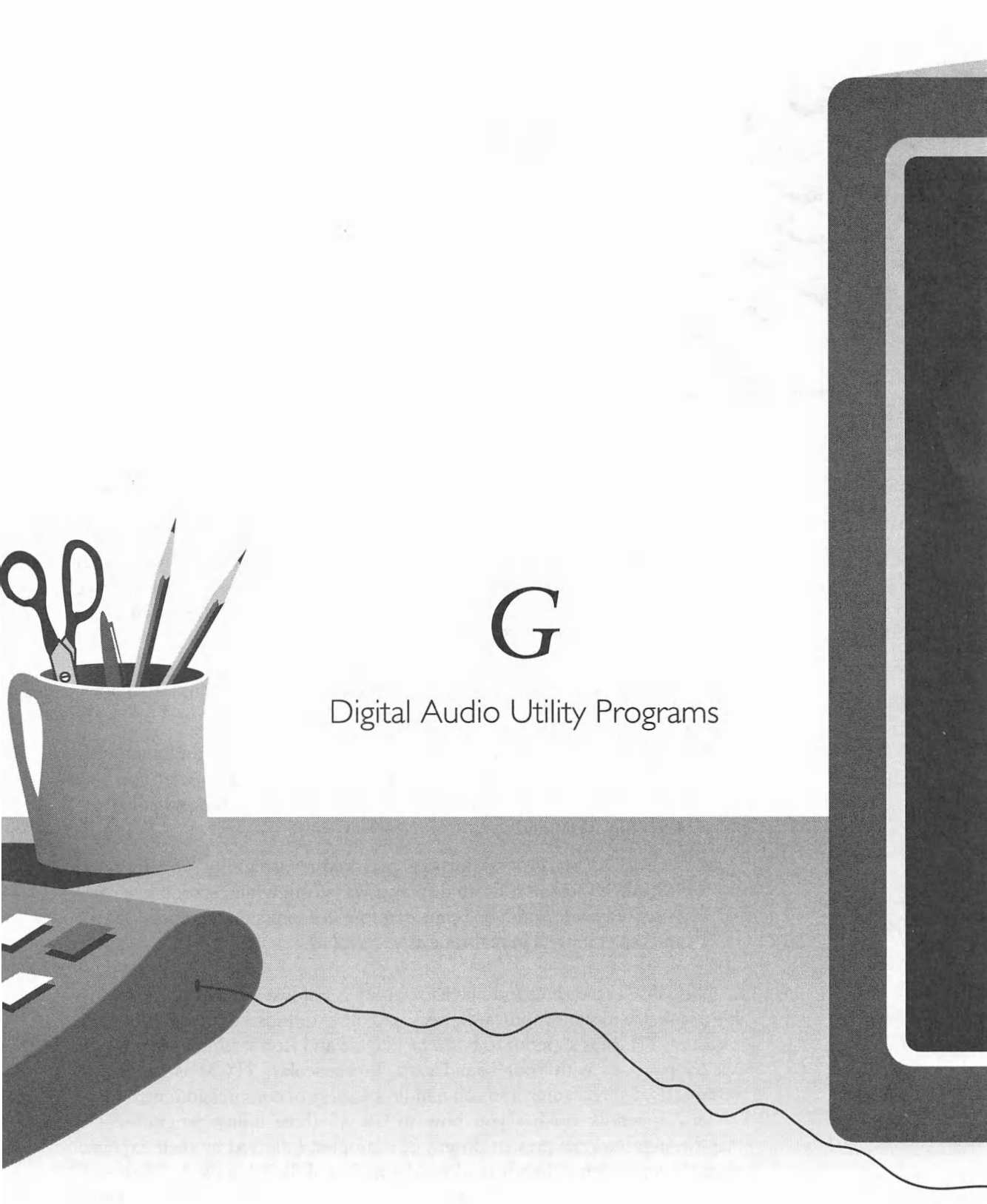
Pocket-Sized Software (MIDI JukeBox)
8547 E. Arapahoe Road, Suite J147
Greenwood, CO 80112
A $5 contribution is requested if you like this product.

Softline, Inc. (Talking Slideshow)
15377 N.E. 90th
Redmond, WA 98052
(206) 861-5463
For a modest $9.95 fee, you can buy the commercial version of Talking Slideshow, which includes a printed manual and technical support.

Advanced Support Group, Inc. (Whoop It Up!)
11900 Grant Place
Des Peres, MO 63131
(800) 767-9611
Compuserve 71431,1571
Ten percent of the proceeds from each Whoop It Up! registration ($29.95 plus shipping) is donated to a nonprofit wildlife preservation organization. Upon registration you receive the latest version of Whoop It Up!, with random events enabled, more exhaustive documentation including a Windows Help file, and over 1MB of sound samples.

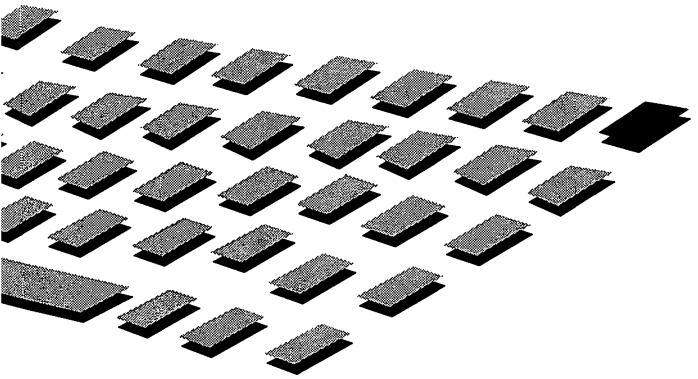






G

Digital Audio Utility Programs



THE diskette that accompanies *ProAudio 16: The Official Book* offers you a set of utility programs that you can use as a toolkit for working with digital audio. You'll enjoy hours of fun with these programs, adding sounds to your PC, making recordings, and experimenting with digital audio recordings. You can produce *voice-activated* recordings, record only when the sound exceeds a threshold in volume, and try out the latest technology for digital audio compression. The three utility programs that are covered in detail in this appendix are CmpWav, PCMFun, and TPCM, each of which is described in its own section.

- CMPWAV.EXE compresses and decompresses 16-bit digital audio Wave (.WAV) files.
- PCMFUN.EXE, in conjunction with LOADPCM.EXE and a variety of minor utility programs, does fun things with sound. After you load .WAV files into memory, you can play them with keystrokes or batch file commands.
- TPCM.EXE is a general-purpose, play-and-record utility program that is flush with features. It can display a waveform while recording, it can save a Wave file with your choice of four compression methods, and it can even compress in real-time as you record.

The TPCM recording and playback utility is not just another powerful toy. It's a valuable tool for capturing speech and other sounds for presentations and pleasure. TPCM is superior to both the Playfile and Recfile utilities that Media Vision provides with your sound card. In particular, TPCM is capable of voice-activated recording and can handle a variety of compression methods.

This appendix teaches you how to use all three utility programs. The step-by-step tutorials present dozens of examples, followed by their explanations. If you haven't already read the discussion of digital audio in Chapter 4, "The Basics of Sound," and Chapter 5, "Advanced Sound Topics," it's to your advantage to do so now.

The diskette includes C language source code for the TPCM and LoadPCM programs. While digital audio programs are easy to use, understanding the source code for these programs can be a daunting task. The source code is likely to be useful only for intermediate to advanced C programmers. If you fall into one of these categories, feel free to incorporate this source code into your own sound programs.



NOTE: *The utilities and source code we've placed into your hands represent a "work in progress." This means that some features may not be fully implemented. In addition, these programs don't do a lot of "hand holding." If you try to make the sound card do something it wasn't designed to do, you may have to reboot your machine. A second caveat is that these programs sometimes push the PC and the DOS operating system to its design limits, so the software may not work correctly on every PC.*

GETTING HELP

The utility programs and source code on the diskette represent the latest sample program available from Media Vision's developer support group, which is under the wing of Bart Crane. If you like what you find here, check the Media Vision BBS (Bulletin Board System) for the latest and greatest utilities and source code. The documentation for these programs occasionally references programs and documents that are not included on the diskette but which are available from the Media Vision BBS. If you're interested in developing programs for Media Vision sound cards, and you have questions about the programs or source code described in this appendix, you can send electronic mail to Bart through the BBS (address it to "Bart Crane").



TIP: *In the \PA16BOOK\PA16UTIL directory, you'll find ASCII text files that have additional documentation on these utilities, taken from the Media Vision BBS. See README.DOC for a file list.*

ACCESSING THE UTILITIES

The digital audio utility programs are found in the directory \PA16BOOK\PA16UTIL. To access these programs, you must be at the DOS prompt. Then you can switch to the proper directory by typing **CD\PA16BOOK\PA16UTIL** and pressing the ENTER key.



NOTE: *If you're currently running Microsoft Windows, switch to the Program Manager and select Exit Windows from the File menu to return to DOS. You shouldn't run these utilities from the DOS compatibility box (which is accessed by selecting the MS-DOS icon in the Accessories group), because the utilities assume they can "take over" your PC. In particular, TPCM will violate system integrity if it's run in the DOS compatibility box.*

PREPARATIONS

The first thing you should do is copy the 8-bit Microsoft Wave (.WAV) files, found in the Microsoft Windows directory, to your digital audio utilities directory. With the DOS prompt in the PA16UTIL directory (assuming that the Windows directory is found on the same drive with the usual directory name), type **COPY \WINDOWS*.WAV** and then press ENTER.

You'll use these 8-bit Wave files to try out TPCM and PCMFun (CmpWav, on the other hand, works with 16-bit Wave files only). If you lack Windows, copy the Wave files from your Media Vision sound card directory, TESTDMA.WAV and TESTIRQ.WAV, and use these instead of DING.WAV, TADA.WAV, CHORDS.WAV, and CHIME.WAV in the examples that follow.

CAPITALIZATION AND FLAGS

You needn't be concerned with proper capitalization when typing program names or when typing filenames used as parameters for these programs. For example, the following commands all play the digital audio file 16BITSND.WAV:

```
tpcm 16bitsnd.wav
TPCM 16BITSND.WAV
tPcM 16bItSnD.wAv
```

However, you should be careful to use the correct capitalization with *command line parameters* that control the operation of the program. For example, the TPCM *-T* command line parameter, which instructs TPCM to use the Sound Blaster compatibility circuitry of your ProAudio sound card, should have a capital T. In many cases the capitalization won't matter, but it's wise to get in the habit of always using the correct capitalization. Command line parameters, such as -T and -t, are often called *flags* or *switches*.

COMPRESSION WITH CMPWAV

The mini-tutorial that follows leads you through the major features of CmpWav. This program compresses digital audio files, and decompresses previously compressed files. Remember that CmpWav works with 16-bit Wave files only. The samples provided with Windows (DING.WAV, TADA.WAV, CHORD.WAV, CHIMES.WAV) as well as the two samples provided by Media Vision with your sound card (TESTDMA.WAV and TESTIRQ.WAV) are 8-bit samples that cannot be used with CmpWav. To try out this utility, you must use the 16-bit wave sample provided, 16BITSND.WAV, or record your own. 16BITSND.WAV is monaural recording, with 16-bit sample size, recorded with a sample rate of 22,050.



NOTE: *If you own the PC Karaoke CD-ROM title, you'll recognize the 16BITSND.WAV sound sample. It's a brief recording of "Twist and Shout," made with the permission of Sirius Publishing, Inc. You can read more about PC Karaoke in Chapter 9, "Media Vision Tools and Toys."*

Copying the Sound Sample

The first thing you should do is make a copy of 16BITSND.WAV, in case it's accidentally overwritten while experimenting with CmpWav. At the DOS prompt type **COPY 16BITSND.WAV 16BITSND.CPY** and then press ENTER.

Restoring the Sound Sample

To get a fresh, unaltered copy of 16BITSND.WAV type **COPY 16BITSND.CPY 16BITSND.WAV** and then press ENTER.

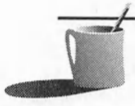
Syntax

The syntax for using CmpWav is: CMPWAV *sourcefile resultfile.*

Examples

TPCM 16BTSND.WAV

To listen to sound files created by CmpWav, you can use TPCM (which is provided on this disk in the same directory as CMPWAV.EXE). Simply type **TPCM 16BITSND.WAV.**



NOTE: *You must specify the file extension (.WAV in this case).*

CMPWAV 16BTSND.WAV SQUISHED.WAV

This command tells the program to look for the file 16BITSND.WAV (which isn't compressed), prompt for one of the compression methods listed in the table that follows, then perform the action and save the output as file SQUISHED.WAV. To create this file now, type **2**, **3**, **4**, or **5**, and press ENTER.

Choice	Method	Description
1	PCM	Linear PCM (not compressed) with header
2	MSADPCM	Microsoft ADPCM
3	IMA	International Multimedia Association
4	ALAW	Bell Telephone
5	MULAW	Bell Telephone
6	RAW	Linear PCM (not compressed) w/o header

Compare 16BITSND.WAV against SQUISHED.WAV to see the effect of the compression. First, listen to both with TPCM. Then, use the DOS Dir command to compare their file size. You'll most likely be pleasantly surprised by the fidelity of the compressed file. Audio file compression using the ADPCM technique (see Chapter 5, "Advanced Sound Topics") is a lossy (the opposite of lossless) compression method, so every time you compress and decompress a file you lose a little sound quality.

CMPWAV SQUISHED.WAV LPCMFILE.WAV

You can decompress a file that was previously compressed. Specify a previously compressed file (for example, SQUISHED.WAV) as the source-file. CmpWav will then create a resultfile, in this case LPCMFILE.WAV, that's an uncompressed (LPCM) file approximately the same size as the original file, 16BITSND.WAV.

CMPWAV -a 16BITSND.WAV SQUISHED.WAV

This command compresses the data in the file 16BITSND.WAV using the ALAW method, saving the output in SQUISHED.WAV. The source file (in this case, 16BITSND.WAV) is assumed to be LPCM (uncompressed) digital audio. Try each flag below, creating a set of files called A.WAV, M.WAV, W.WAV, and I.WAV, and then compare their file size and fidelity.

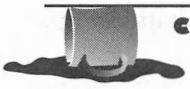
The following command flags specify the compression technique:

Flag	Method	Comments
a	ALAW	Fast 2:1 compression; low fidelity
m	MULAW	Similar to ALAW
w	MSADPCM	Not implemented for real-time compression
i	IMA	4:1 compression; good fidelity but requires a fast (386 or better) machine; prospective MPC standard for compression

CMPWAV -A SQUISHED.WAV LPCMFILE.WAV

This command tells CmpWav that the file SQUISHED.WAV was previously compressed with the ALAW technique and should now be decompressed and saved as LPCM.WAV. CmpWav can usually recognize the file type by examining the file header. If it can't tell, or the header information is wrong, or this is "raw" compressed data, you can explicitly tell CmpWav what type of data is provided, and hence how to decompress the file, by using a flag:

Flag	Method
A	ALAW
M	MULAW
W	MSADPCM
I	IMA



CAUTION: *The command line switch, when lowercase, causes file compression to take place. If the switch is uppercase, decompression occurs. It's easy to be confused on this point and to accidentally compress a previously compressed file or to "decompress" an uncompressed file. Both situations result in creating a file that contains nothing but noise.*

Limitations of CmpWav

Remember that CmpWav can compress only 16-bit files. Also, you cannot decompress and compress in the same command.

Attempts to process files not conforming to CmpWav's expectations (for example, trying to process digital audio files with a sample size other than 16-bits or with unrecognized file formats, and the like) may generate unpredictable results, although every attempt has been made to eliminate crashes, hangs, and lock-ups.

Technical Notes

The MSADPCM Compression Algorithm, used by both CmpWav and TPCM, is based on Microsoft's Multimedia Standards Update of August, 1992. The MULAW, ALAW, IMA Compression Algorithms are based on various public domain sources. For IMA, wavformat.fmttag == 3. This value hasn't been blessed by Microsoft, so there's the potential for future incompatibility.

PLAY AND RECORD WITH TPCM

PCM.EXE is a feature-packed play-and-record utility that handles both 16-bit and 8-bit digital audio. This section documents the features you're most likely to use.



TIP: *To terminate play or record by TPCM, press the* ESC *key.*

Digital Audio Play

The tutorial that follows illustrates how to control sound file playback by TPCM. If you don't hear sound when you start this tutorial, make certain that the master volume level in the PAS Mixer is turned at least halfway up.

Onscreen Display of Command Line Switches

TPCM -h

This command displays the command line switches recognized by TPCM.

Digital Audio Play Examples

The command TPCM TADA.WAV plays the file TADA.WAV. (You must include the file extension.) This routine plays Wave files, both uncompressed and compressed, automatically recognizing the type of compression.

TPCM -T TADA.WAV

Adding the -T switch plays the file on the Sound Blaster-compatible part of the sound card. You can play 8-bit, but not 16-bit Wave files on the Sound Blaster-compatible circuitry. This restriction is due to Media Vision's faithful emulation of the Sound Blaster circuitry—including it's limitations. You'll

probably notice that the sound quality is inferior to the Pro Audio 16 native circuitry that handles both 8-bit and 16-bit digital audio.

For the -T switch to be used successfully, you must have a SET BLASTER environment string that tells TPCM the correct settings for Sound Blaster emulation.

TPCM -v TADA.WAV

The -v switch shows a visual display of the waveform as the sound file is played. If you play a stereo file you see two waveforms, one for the left channel and one for the right.

TPCM -iMYSTERY.FIL -r22050 -s -l16

TPCM can play "raw" digital audio files, which lack a header that identifies the type of compression (if any), the number of bits, and sample rate. The -r,-s, and -l switches in the command TPCM -iMYSTERY.FIL -r22050 -s -l16 tell TPCM how to play the file. The -i switch precedes the filename (in this case MYSTERY.FIL), and tells TPCM that this is a raw file. The -r switch precedes the sample rate (the default, if the switch isn't there, is 11025). The -s switch, if it exists, indicates that the data should be treated as stereo rather than monaural. The -l (lower case L) switch, if it exists, indicates the number of bits (the default is 8 bits). MYSTERY.FIL doesn't exist, so you will see the message, "Input file not found."

TPCM -iTADA.WAV -r22050

This command plays a Microsoft Wave file, in this case TADA.WAV, at its correct sample rate, 22050, with the defaults of monaural and 8-bit. If you play a digital audio file that has a header, like TADA.WAV, it assumes that the header is sound data, giving you noise at the beginning of play.

TPCM TADA.WAV -r88200

Adding the -r switch (TPCM TADA.WAV -r88200) has no effect, because without the -i switch before the filename, TPCM checks the file header and uses the correct sample rate (11025) and number of bits.

TPCM -iTADA.WAV -r88200

In this command, TADA.WAV is viewed as a raw digital audio file, and the sound data is played at the sound card's maximum speed, 88200 samples per second. The sound file is played at eight times its normal speed, resulting in a higher pitch.

TPCM -L TADA.WAV

The -L switch causes TPCM to loop, repeatedly playing the sound sample until you press the ESC key.



NOTE: *If TPCM won't stop looping after you press the* ESC *key, do the following to stop TPCM. First, repeatedly press* CTRL-BREAK *until the DOS prompt reappears. Then enter another TPCM command, such as TPCM DING.WAV, to override the current one.*

Playback Control Keys

The following keys control play while a file is played. Since most digital audio files are short, you should use the -L switch (described by the last example of the Digital Audio Play section) to loop the sound output so you can observe the impact of these commands.

Keystroke	Effect on Playback
< >	Slows/speeds playback rate (sampling rate) with large percentage jumps in speed.
, .	Slows/speeds playback rate in increments of 100 samples/second.
m	Shows number of PC clock ticks since begin of play (18.2 per second), number of samples played, and total number of bytes read so far.
p	Pauses playback or record. Press any other key to resume.
i	Displays current sample rate, number of channels (1 for mono, 2 for stereo), and sample size in bits (8 or 16).

Digital Audio Recording

To experiment with digital audio recording, you have to select a source of sound to record and then set up the mixer for proper recording. The tutorial that follows illustrates the recording features of TPCM in a step-by-step fashion.

Selecting a Sound Source

You need either a microphone or a CD-ROM drive for a ready source of sound for recording. If you're using a CD-ROM drive, the Music Box program, which runs from the DOS command line, is an ideal source for sound because it can play high-fidelity audio CDs. You can also attach an external sound source, such as your stereo output, to the Line Input of the sound card.

The command PAS * displays the PAS Mixer on your screen. Using the arrow keys, you can adjust the initial settings for your mixer. You can select a source, such as the microphone, internal connector (which is audio from your CD-ROM if you have a CD-ROM drive installed), or external jack to receive sound through your sound card's Line Input. Select the source you wish to use for your recordings.

USING MUSIC BOX AS YOUR SOUND SOURCE The easiest way to use Music Box (discussed in Chapter 6, "Making Recordings and Playing Music") is to run Music Box by typing MUSICBOX at the DOS prompt. Once it appears, select the Play button. Then press the ESC key to remove Music Box from the screen and restore the DOS prompt. Although Music Box is no longer running, the CD-ROM hardware plays the audio CD until the end of the track, providing enough music for many experiments.

Controlling the Mixer

After you've made a recording, you'll want to hear it. Since the audio source is probably still playing, you'll need to temporarily mute it. This is most easily performed by PAS Mixer commands entered at the DOS prompt. These commands are documented in Chapter 3, "System Software and Drivers." For your convenience, the commands most directly relevant to the examples in this appendix are repeated here.

PAS SET INT TO 0
This example shows how the PAS Mixer is controlled by commands typed at the DOS prompt. This command mutes the audio from the internal connector by setting the volume to 0.



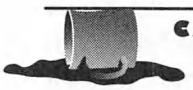
TIP: *You can see the command line options for the PAS mixer by typing PAS only, followed by pressing* ENTER.

To control the microphone input, substitute MIC for INT. To control the external input, substitute EXT for INT.

PAS SET INT TO 75
This command restores the normal volume level for sound from the internal connector (CD-ROM audio).

Digital Audio Recording Examples

TPCM -R X.WAV (and press ESC in two seconds)
In this example the -R switch tells TPCM to record sound. If a space follows the -R, as shown here, TPCM will create linear PCM (LPCM) digital audio, saving the output to a file called X.WAV until you stop recording by pressing ESC. LPCM digital audio is uncompressed data, the type you're most likely to encounter when you have digital audio files. 16BITSND.WAV, provided on the diskette, TADA.WAV, and the other Microsoft Windows digital audio Wave files that come with Windows, are all LPCM digital audio.



CAUTION: *You can quickly fill your hard disk with digital audio. When you record 8-bit digital audio, at 44,100 samples per second in stereo, you create a 5.29MB file in just one minute! Press ESC after 1 or 2 seconds to stop the recording and keep the file small.*

Now mute the audio source by using the PAS SET *audiosource* TO 0 command, where *audiosource* is INT, EXT, or MIC, as described in the preceding section, Controlling the Mixer. Next, listen to your file using TPCM to check your recording. Then restore your audio source to full volume using PAS SET *audiosource* TO 75.

TPCM -v -R X.WAV (and press ESC soon)
The -v switch in this command displays the waveform as it records.

TPCM -v -R -r44100 -s -l16 CDQUALITY.WAV (and press ESC soon)
The switches in this example result in a CD-quality recording. The -r switch specifies the sample rate, the -s switch specifies that the recording is to be in stereo, and the -l switch indicates that the sample size is 16 bit. There's no point in using the -s switch when recording from the microphone, because microphone input is monoaural. Since the recording is in stereo, the waveform display shows both channels.

The command line switches can be combined for convenience. TPCM -vRr44100sl16 CDQUALITY.WAV is equivalent to the previous command.

TPCM -v -RI -r11025 -s -l16 IMA_FILE.WAV (and press ESC soon)
When you use this command, a file called IMA_FILE.WAV is created that has been recorded using the IMA compression technique. When you add a letter after the -R flag, you tell TPCM which compression technique to use. The choice of flags are I (for IMA), A (for ALAW), and M (for MULAW). These compression techniques are described in the CmpWav section of this appendix.

If your computer is fast enough, you can record in real-time (keeping up with the sound source). Notice that the sample command records at only 11,025 samples per second. Not all computers can keep up with real-time sampling at 44,100 per second and compression at the same time. Should your recording or playback suffer from crackles, pops, or other weird sounds, your PC's processor or hard drive may not be fast enough for the selected sample rate. You can almost always record LPCM data at a full 44,100 sample rate, because virtually all the work is done by the sound card's PCM circuitry rather than your computer's central processing unit (CPU).



TIP: *See Chapter 4, "The Basics of Sound," and Chapter 5, "Advanced Sound Topics," for information on how to select the ideal sample rate for your recording situation.*

TPCM -R -V5 VOX1.WAV

The -V switch in this example causes TPCM to do voice-activated recording (often referred to as VOX) using the default settings for recording: 11020, 8-bit, and mono. With VOX, recording only takes place when the sound source volume is above a minimum threshold. Recording is temporarily suspended during silent or quiet periods. The number after the -V switch controls the sensitivity. The most useful range of values for -V is 3 to 15. The higher the number, the stronger the source volume must be before recording commences. A setting of V3 records most everything but silence, while a setting of V15 picks up only the loudest of noises. Shortly after the sound source drops in volume, recording is suspended. To get a good feeling for how this works, try VOX recording with microphone input.

TPCM -RM -r22050 -V5 X.WAV

This command creates a file X.WAV that captures, in real-time, your audio source using the MULAW compression technique.

PCM FUN WITH PCMFUN

PCMFun plays 8-bit sound files loaded into extended memory (XMS). You can amuse your friends by adding the voice of a genie to your computer, which will then answer, "Yes, master, what do you command?" whenever you press a special key combination (often called a *hot key combination*) or run a batch file.

If you don't know whether your PC has extended memory, run the DOS MEM program to see if you have any (try MEM/C to get more detail). If you lack extended memory, please review your DOS manual to find out how to set up a memory manager to provide extended memory.



NOTE: *PCMFun minimizes its use of conventional memory, which is needed by other programs, by loading itself into the memory area reserved for the monochrome monitor. This conserves precious memory but causes sound playback quality by PCMFun to be slightly inferior to that of TPCM. The documentation files for these utilities provide more detail.*

Examples



TIP: *Use only 8-bit Wave files with PCMFun. If you intend to use Recfile to create Wave files, you must explicitly add the .WAV file extension. Unless you add a command flag, Recfile will create 8-bit Wave files, which is what you want it to do.*

PCMFUN -i

This command loads the PCMFUN.COM program into memory. It provides "hooks" to digital audio, the PC timer, and video services. The other utility programs you run depend on PCMFun to deliver these services.

The LoadPCM utility loads Wave files into extended memory for use by PCMFun. The examples that follow show how to load three Wave files and get information on what's loaded.

- LOADPCM 1 DING.WAV loads the DING.WAV sound file into the first of the 256 slots available for use by PCMFun.
- LOADPCM 2 CHIMES.WAV loads CHIMES.WAV into the second slot.
- LOADPCM 3 TADA.WAV loads TADA.WAV into the third slot.
- LOADPCM s shows a list of slots already assigned.
- LOADPCM 1 shows internal information about slot 1 as displayed here:

```
1: PAS H: A912  O:   15876  S:   11554
R:  22050 C:  1  D:  8      ding.wav.
```

You can see, from right to left, that the preceding information translates into the following:

```
ding.wav  wavefile name
D:8       8 bit samples
C:1       monaural (1 channel); stereo is 2
R:22050   22,050 sample rate
S:11554   file size (less file header information)
O:15876   offset into extended memory block
H:A912    XMS handle
1:PAS     output on the Pro Audio circuitry (versus Sound
Blaster emulation circuitry)
```

Typing the command KEYX 1 simulates pressing the **1** key on your keyboard. When this command is issued, you should hear the Wave file loaded into slot 1. The KEYX command can be placed into a batch file.

KEYX 3 plays sound in slot 3.

SSKEY ON enables hot key play of sounds; an example is given next.

Hold down the left and right SHIFT keys while momentarily pressing the 1 key. This is the hot key combination for triggering the sound in slot 1. You can repeat this, pressing the appropriate number key each time, for slots 1 through 9.



NOTE: *You'll have to locate a PC technical reference manual to access the other sound slots via this technique. The slot number is determined from the key's scan code, and the proper key for slots 10 and beyond isn't obvious without a technical reference.*

SSKEY OFF temporarily disables the ability to play a sound with a hot key combination. Use SSKEY ON to re-enable hot key play.

TMR 3 SET 36 sets the timer for slot 3 (timers are available for the first 64 slots) to trigger after approximately two seconds (36 clock ticks). There are 18.2 ticks per second issued by the PC's internal clock.

TMR 3 ON turns on timer 3.

TMR 3 OFF turns off timer 3.

LOADPCM 1 -d deletes the Wave file from slot 1.

PCMFUN -u removes PCMFun from memory. You receive the message "Sorry, but ..." if PCMFun can't remove itself from memory. In that case, you should reboot your machine before running other programs, to clean up your PC's memory.

MEDIA VISION'S PCM

A version of PCM.COM was loaded onto your hard drive when your sound card and Media Vision software were installed. A second copy of PCM.COM is provided on the diskette, and it is copied to the \PA16BOOK\PA16UTIL directory along with the digital audio utilities.

PCM.COM provides services that are needed by other programs, including TPCM.EXE. PCM.COM is a valuable tool for software developers. It operates as either a terminate and stay resident (TSR) program or as an interrupt service routine (ISR). It can control either the Pro Audio 16 native circuitry or the Sound Blaster-compatible circuitry of your sound card. You don't need to use PCM directly, because TPCM delivers these features to you. Please see the documentation on disk, including README.DOC, for more information.

SOURCE CODE

The diskette includes C source code for TPCM (which in essence also gives you the source code for PCM) and LoadPCM. Make files, which contain instructions on how to make an executable program from source code, are provided for TPCM.EXE and LOADPCM.EXE. You need the Microsoft C compiler and Microsoft Assembler to use the make files and source code as is. The C source is generic C, so if you're an intermediate-to-advanced C programmer comfortable with these tools, you should be able to use another environment such as Borland C.

If you find the C source to be valuable, and you're interested in doing further C development for the digital audio circuitry, the FM synthesizer, or other aspects of the sound card, you should order the Media Vision Software Developer's Toolkits (SDKs). See Appendix D of this book for details.

INDEX

Numbers

3-D graphics cards, 24, 27
7th Guest, 199-201, 213, 257, 375
8-bit digital audio
  versus 16-bit digital audio, 39, 106, 107
  ADPCM compression, 124
  PCMFun software, 460-461, 471-474
  TPCM software, 135, 460-461, 466-471, 473-474
  See also Digital audio
8-bit sound cards
  Audio Port sound device, 21, 43, 44, 46, 376-378
  Thunder & Lightning, 48, 49, 376-378
  See also Thunder Board
11th Hour CD-ROM title, 200
16-bit digital audio
  versus 8-bit digital audio, 39, 106, 107
  CmpWav compression software, 460, 463-466
  CODEC chip, 39-40, 42
  compressing, 123
  TPCM software, 135, 460-461, 466-471, 473-474
  See also Digital audio
16-bit sound cards, 368-373
  DMA settings for, 49
  IRQ settings for, 53
  overview of, 4-5
  port addresses and, 55
  slots for, 43-44, 45
  See also Media Vision products; Sound cards; *all Pro Audio 16 sound card entries*
486 computers, 392

A

AC adapters, for speakers, 316
Access Software, LinksPro 386 game, 223-224
Access time (CD-ROM), 271-272
Accolade, Hardball III, 225
Aces of the Pacific game, 220
Aces over Europe game, 220
ACM joystick card, 361-362
Acoustic Research speakers, 320-321, 324-325, 329-331, 335
Action!, 202-203, 212, 375
Action game control pads, 356-359
Action games, 222-223
  Flashback, 222
  Out Of This World, 222
  Prince of Persia 2, 223
  Wolfenstein 3D, 222, 410
Active speakers, 310
Adaptive digital pulse code modulation (ADPCM) compression system, 42, 121-124
Add-on boards, 43
Addresses
  for CD-ROM drive and software vendors, 294-295
  for CD-ROM publishers, 211-213
  I/O port, 52-55, 56, 390
  memory, 55-56
  SCSI (IDs), 417
  for software publishers, 260-262, 454-456
AdLib sound card
  drivers for, 66, 409
  history of, 8-9, 10
  .ROL files and, 110

ADPCM compression system, 42, 121-124
Advanced Gravis
  Eliminator joystick card, 361-362
  PC GamePad, 356-357, 362
Advanced SCSI Programming Interface (ASPI) protocol, 421-422
Advanced Support Group, Whoop It Up!, 246-247, 260, 440, 453-454, 456
Adventure games, 223
After Dark software, 247-248
Algorithms, for waveforms, 117-118
Aliasing, 40, 119-120
Alone in the Dark game, 223
ALT key, volume control with, 65
Altec Lansing speakers, 325-326, 331-332, 333-334, 335
Amplifiers, in Pro Audio sound cards, 309-310
Amplitude, 94, 95-96, 121-122
Analog-to-digital conversion (ADC), 103, 104
  chips for, 39-40
  DMA settings and, 47
Anti-aliasing filters, 40, 119-120
Apple computers. *See* Macintosh computers
Application specific integrated circuits (ASIC chips), 19
Arcade game control pads, 356-359
Archival compression software, 107, 120, 207
Arthur's Teacher Trouble, 192-193, 259, 375
Artisoft, Wired for Sound Pro, 247, 260
ASCII files, Monologue and, 149
ASIC chips, Media Vision, 19
ASPI (Advanced SCSI Programming Interface) protocol, 421-422
AT-compatible bus, 43
Attack velocity, 173
Audio CDs
  care of, 280-281
  CD-R/CD-WO (recordable) discs, 268, 288
  double speed CD-ROM drives and, 273-275
  history of, 267-268
  life of, 270
  listening to CD-ROM titles in players for, 205
  magnetic fields and, 271
  playing in CD-ROM drives, 132-133, 136, 404
  See also CD audio; CDs
Audio compression/decompression, 107, 120-124
  adaptive differential pulse code modulation (ADPCM) system, 42, 121-124
  CmpWav software, 460, 463-466
  compression speed, 123
  degradation and, 123-124, 137
  digital signal processing (DSP) and, 125-126
  hardware compression, 386
  linear pulse code modulation (LPCM) system, 121-122
  lossless versus lossy compression techniques, 123-124
  Pocket Recorder and, 107, 123, 137
  quantization errors, 124
  real-time 16-bit, 123
  requirements for, 120-121
  scaling factors and, 122
  Sound Blaster 16 ASP and, 24
  See also Video compression/decompression
Audio connectors
  for CD-ROM drives, 37, 285-286, 296-297, 300
  internal, 37, 387
Audio Interchange File Format (.IFF), 108-109
Audio Port sound device
  buses and, 43, 44, 46
  overview of, 21, 376-378

Audio technologies, 100-107
analog-to-digital conversion (ADC) and, 103, 104
bandwidth and, 99
digital signal processing (DSP), 125-126
digital-to-analog conversion (DAC) and, 103-104, 105
FM synthesis, 9, 101-102, 171-172
MIDI language, 103, 125, 166-168, 173-175
sample size, 105, 106-107
sound types and, 100, 209, 385-386
waveguide synthesis, 124-125
wavetable synthesis, 24, 25, 102-103
See also Audio compression/decompression; Digital audio; File formats; Sampling; Sampling rate; Sound
Audio/video files (.AVI), 139
AUDIOTEC.HLP file, 138
AudioView software, 250-251
AUTOEXEC.BAT file
CD-ROM driver settings, 297-298, 299-300, 302
Monologue settings, 147
playing sound files from, 134
PROAS.EXE driver settings, 70
software on book's diskette and, 439
Sound Blaster emulation settings, 69-70
sound card driver settings, 63, 69-70
for troubleshooting, 388, 389
Average access time (CD-ROM), 271-272
.AVI files, 139

B

Back plane, 43
Background noise, speech recognition and, 153, 162
Band-in-a-Box Pro software, 234-235
Bandwidth, 97-99
of audio systems, 99
of buses, 42-43
defined, 97-98
equalization and, 116-118
frequency and, 97-98
of male opera singing voice, 116
sampling and, 107
of sound cards, 98
Bargains
on CD-ROM drives and software, 294-295
on Media Vision products, 367-368
Base address, 54
Base-level synthesizers, 184-185
Battle Chess Enhanced CD-ROM, 198-199, 375
BBSs. *See* Bulletin board systems (BBSs)
Beethoven: The Ninth Symphony CD-ROM title, 258
Berkeley Systems
After Dark, 247-248, 260
Star Trek: The Screen Saver, 248, 260
Bidirectional MIDI controllers, 40
Blaster Master software, 248, 260
Bloc Publishing, CD Speedway cache, 303-304
Blocks, sound
file formats and, 108, 109, 110, 111
silence blocks, 121
Blue Ribbon SoundWorks, SuperJAM!, 226-227, 261
Board ID jumper, 37-38
Book's software diskette. *See* Software on book's diskette
Bookshelf program, 258, 406
Boom Box software, 229
Boost controls, 41
Bose speakers, 332-333, 335
Brøderbund Software
address, 211
Arthur's Teacher Trouble, 192-193, 259, 375
Just Grandma and Me, 259
Prince of Persia 2, 223
Where in the World Is Carmen Sandiego?, 191-192, 375

Bulletin board systems (BBSs)
Media Vision, 208, 384, 429
.MOD files on, 132
MVSOUND.SYS driver, 66
on-line forums, 426-428
PAS16D1.ZIP file, 135
PROGRAMS.LZH file, 135
TBPRO.ZIP file, 132
for Technical Support, 208, 384
Bus architecture, 42-46
AT-compatible bus, 43
bandwidth and, 42-43
bus speed (megahertz), 43
card slots and connectors, 43-44, 45
changing bus on-time and off-time settings, 411
EISA (Extended Industry Standard Architecture) bus, 44-45
ISA (Industry Standard Architecture) bus, 43-44, 45, 46
laptop bus architecture, 45-46
local bus, 45
MCA (Micro Channel Architecture) bus, 44
overview of, 42-43
PCMCIA cards and connectors, 46
Peripheral Component Interconnect (PCI), 45
SCSI bus, 414
Bus mouse, IRQ settings and, 52
Buzz Aldrin's Race Into Space game, 225-226
Byte magazine, 429

C

Cables
for CD-ROMs, 285-286
in MIDI networks, 171
for speakers, 316, 336
See also Connectors
Caches, types of, 303
Cakewalk Professional MIDI sequencer, 237-238
CAM (Common Access Method) protocol, 421
Captain Crunch software, 27
Card slots, 43-44, 45
CD audio
chips sets and, 39
creating, 100
defined, 385
game software and, 300-301
quality of, 106
See also Audio CDs
CD caddies, 280-281, 295
CD Speedway cache, 303-304
CDPC multimedia systems, 21, 317, 376-378
CD-R discs, 268, 288
CD-ROM driver software, 285-286, 297-302, 394-397
CD-ROM drives, 266-305
audio connectors for, 37, 285-286, 296-297, 300
average access time, 271-272
bargain vendors, 294-295
compatibility, 275-279, 286
disc caddies, 280-281, 295
double-speed drives, 273-275
dust doors, 281
gain control options and, 84
history of, 267-268
installing driver software, 285-286, 297-302, 394-397
installing hardware, 284-286, 295-297
internal versus external, 284-285
Kodak Photo CD compatibility, 279
lens cleaners, 281
life of CDs, 270
magnetic fields and, 271
Media Vision multimedia upgrade kits and, 283
memory and, 299-300
mixer settings, 300-301
MPC standards and, 12, 273, 276-279

MSCDEX.EXE driver parameters, 297-300, 302, 394-397
MTBF (Mean Time Between Failure) specification, 281-282
multidisc changers, 288-289
NEC MultiSpin drives, 287-288, 294, 305
non-SCSI connectors, 37
Pioneer drives, 275, 281, 288-290
playing audio CDs in, 132-133, 136, 404
Pro Audio sound card compatibility, 275-276, 277, 286
Pro Audio sound cards and, 4, 283
purchasing, 282-295
RAM buffers, 273, 303
reliability, 280-282
SCSI connectors, 37, 283, 284-285, 296, 386
SCSI controller and, 41, 276, 394-397
software caches, 303-304
Sony drives, 290-291, 395
sound quality of, 100
speed of, 271-275
startup messages, 298
storage capacity of, 268-271
Technical Support, 282, 386
testing, 299
Texel drives, 275, 291-292, 294
Toshiba drives, 275, 292-293, 294
transfer rate, 272-273
TSLCDR.SYS driver parameters, 297-302, 394-397
types of audio on, 100, 209, 385-386
upgrade policies, 282
viruses and, 268
warranties, 282
See also Audio CDs
CD-ROM Multimedia Kit for Macintosh, 435
CD-ROM titles, 190-213, 256-260, 375
7th Guest, 199-201, 213, 257, 375
11th Hour, 200
archival compression software and, 207
Arthur's Teacher Trouble, 192-193, 259, 375
Battle Chess Enhanced CD-ROM, 198-199, 375
bundled with multimedia upgrade kits, 375
Cinemania, 258, 259
Civilization, 202, 375
Critical Path, 256
Day of the Tentacle, 257-258
educational titles, 191-193, 259-260
entertainment titles, 196-202, 257-258
hard disk space and, 206-208
Interactive Encyclopedia, 195-196, 375, 406
Just Grandma and Me, 259
listening to in audio CD players, 205
Macromedia Action!, 202-203, 375
Mantis Experimental Fighter, 201, 375
Mayo Clinic Family Health Book, 193-195, 375
memory and, 206, 211
Microsoft Bookshelf Multimedia Edition, 258, 406
Mixed Up Mother Goose, 260
Multimedia Beethoven: The Ninth Symphony, 258
multitasking and, 204-205
overview of, 256-260
PC Karaoke, 196-198, 375
performance of, 204-208
productivity titles, 202-203
Quantum Gate CD-ROM title, 256
reference titles, 193-196, 258-259
running DOS titles in Windows, 211
software publishers, 211-213
Space Quest, 258
Space Shuttle, 258-259
speeding up, 205-206
troubleshooting, 208-211, 406
vendors for, 295
Where in the World Is Carmen Sandiego?, 191-192, 375

CDs
care of, 280-281
CD-R/CD-WO (recordable) discs, 268, 288
history of, 267-268
Kodak Photo CDs, 279
life of, 270
magnetic fields and, 271
See also Audio CDs; CD-ROM drives
CD-WO disks, 268, 288
Central processing units. *See* CPUs
CH Products, 342-346, 361-362
CH FlightStick, 343-344, 345
CH Virtual Pilot, 344-346
GameCard III joystick card, 361-362
Channel numbers, MIDI, 173
Chips, 38-42
CODEC chip, 39-40, 42
digital signal processing (DSP) chips, 125-126
FM synthesizer, 4, 40, 55
LSI (large scale integrated) circuits, 268
MIDI controller, 40-41
mixer and volume control, 31-32
MotiVE video chip set, 27
Multimedia Controller, 39, 41
PCM (pulse code modulation) circuitry, 39-40, 47, 118-119, 144-145
SCSI controllers, 41, 50, 276, 394-397
Sound Blaster-compatible audio processor, 42, 48, 52, 55, 56
Chowning, John, 101, 125
Cinemania CD-ROM title, 258, 259
Civilization game, 202, 375
Clients, OLE, 140
.CMF files, 109, 110, 248
CmpWav software, 460, 463-466
Cockpits, 352-355
CODEC chip, 39-40, 42
COM ports, IRQ settings and, 52
Comanche: Maximum Overkill game, 221-222
Command and control software, 152-153
Command Corp., InCube Voice Command software, 152, 440, 442-446, 455
Commodore Amiga
Audio Interchange File Format (.IFF), 108-109
.MOD file format, 109-110
Common Access Method (CAM) protocol, 421
Compatibility
AT-compatible bus, 43
CD-ROM drive/Pro Audio sound card, 275-279, 286
Kodak Photo CD, 279
SCSIworks!/SCSI device, 420-421
Sound Blaster-compatible audio processor, 42, 48, 52, 55, 56
See also Emulation
Compression software, archival, 107, 120, 207, 429
See also Audio compression/decompression; Video compression/decompression
Compton's Interactive Encyclopedia, 195-196, 212, 375, 406
CompuServe forums, 426-428
Computer Game Developer's Conference, 431
Computer Games Strategy Plus magazine, 418
Computer Gaming World magazine, 417
Conferences, 430-431
CONFIG.SYS file
CD-ROM driver settings, 297-298, 299-300, 301-302
DMA and IRQ settings in, 51-52, 388
MVSOUND.SYS driver settings, 51-52, 66-68, 393-394, 398
software on book's diskette and, 439
Sound Blaster emulation settings, 67, 85
sound card driver settings, 63
for troubleshooting, 388, 389
Configuration labels, hardware, 58-59
Conflicts
DMA, 50-51, 391

IRQ, 391
MIDI/Joystick port, 360-361
Connectors, 33-38
audio connectors for CD-ROM drives, 37, 285-286, 296-297, 300
Board ID jumper, 37-38
CD-ROM cables, 285-286
DRQ (Data ReQuest line) latch jumper, 38
external, 33-35
internal, 35-38
internal audio (CD) connector, 37, 387
internal speaker connector, 37
microphone input jack, 35, 387
Midi Mate MIDI connector box, 35, 36, 341, 380, 398
MIDI network cables, 171
for multimedia systems, 33
non-SCSI connectors, 37
PCMCIA cards and connectors, 46
SCSI connectors, 37, 283, 284-285, 296, 386
sound card slots and connectors, 43-44, 45
speaker cables, 316, 336
Speaker Out connector, 34, 336
Stereo Line-In connector, 35, 386
Stereo Line-Out connector, 34, 336, 386
See also MIDI/Joystick port
Continuous speech systems, 162-163
Control pads, 356-359
See also Flight simulator controls; Joysticks
Control Panel settings, Windows, 81, 82, 84-86
Converting, file formats, 108
Copyrights, MIDI music and, 168
CPU caches, 303
CPUs
digital signal processing (DSP) chips and, 125-126
DMA channels and, 47
I/O port addresses and, 52-54
interrupt requests and, 51
MOD players and, 131-132
Creative Labs
Creative Music Format (.CMF), 109, 110, 248
Game Blaster sound card, 9
history of, 9-10, 21-23, 24-25
lawsuit against Media Vision, 22-23
SBSOUND.COM driver, 409
Sound Blaster sound card, 9-10, 21-22, 55, 66, 409
Sound Blaster Pro sound card, 20
Sound Blaster 16 ASP sound card, 24-25
Sound Blaster emulation, 67, 69-70, 85, 390, 391-392
Sound Blaster games, 407
Sound Blaster instrument bank files (.IBK), 109
Sound Blaster Instrument files (.SBI), 109
Sound Blaster-compatible audio processor, 42, 48, 52, 55, 56
stock market symbol for, 23
Voice files (.VOC), 111, 121, 134, 135, 248, 250
Creative Music Format (.CMF), 109, 110, 248
Critical Path CD-ROM title, 256
CTRL key, volume control with, 65
Customer Service, 32, 367-368, 384-385
Cut controls, 41

D

Daisy-chaining MIDI devices, 170-171
Data ReQuest line (DRQ) latch jumper, 38
Day of the Tentacle CD-ROM title, 257-258
DC adapters, for speakers, 316
Decibels (dB), 95-96, 99, 312-313
Degradation, audio compression/decompression and, 123-124, 137
Developer's kits (SDKs), 102, 431

Dictation software, 152, 153, 162
Dictionaries
  Monologue, 145-146, 147, 149, 151-152
  online, 195
Digital audio, 103-107, 385
  8-bit versus 16-bit, 39, 106, 107
  defined, 385
  digital audio compression, 107
  digital-to-analog conversion (DAC), 39-40, 103-104, 105
  DMA settings and, 47, 50
  editing, 39
  file compression software, 460, 463-466
  input filters and, 118-119
  limitations of, 106-107
  LPCM digital audio, 121-122
  Nyquist theorem, 105, 107, 119-120
  PCM circuitry and, 39
  sound quality of, 105, 106
  waveguide synthesis, 100-101
  See also 8-bit digital audio; 16-bit digital audio; Analog-to-digital conversion (ADC); Audio compression/decompression; Audio technologies; Sampling; Sound
Digital signal processing (DSP), 125-126
Digital-to-analog conversion (DAC), 103-104, 105
  chips for, 39-40
DigPak programming tools, 253
DIR command, DOS, 205
Direct memory address channels. *See* DMA channels
Directories
  creating sound card, 64
  DOS PATH statement and, 69
  for Monologue programs, 147
  QUICK subdirectory, 207
  TEMP directory, 207-208
  TSCSI directory, 297
Disc (CD) caddies, 280-281, 295
Discounts
  on CD-ROM drives and software, 294-295
  on Media Vision products, 367-368
Disk space. *See* Hard disk drives
Disk-doubler software, 107, 206-207
Diskettes. *See* Hard disk drives; Software on book's diskette
Disney Software games, 408
Distortion
  aliasing, 119-120
  defined, 99-100
  speakers and, 313
  See also Noise
DMA channels, 38, 47-52, 386
  CONFIG.SYS settings, 51-52, 388
  default settings, 389-390
  determining settings, 387-388
  DMA conflicts, 50-51, 391
  ideal settings, 56
  overview of, 47, 386
  selecting, 47-50
  setting jumpers for, 46, 391
  sharing, 47, 50
  for Sound Blaster emulation, 390, 391
  TrakBlaster Pro settings, 132, 399
  troubleshooting settings, 389-392, 395, 399, 402
  for Windows drivers, 84-85, 402
DOS
  DIR command, 205
  DMA settings and, 49
  ideal settings for, 56
  installing book's software in, 439, 441
  IRQ settings and, 51-52
  text editor, 65
  troubleshooting CD-ROM titles for, 208-210, 211
DOS driver software, 63, 65-76
  AUTOEXEC.BAT settings, 69-70
  directories for, 64

DOS mixer program (PAS.EXE), 70-76, 405
MVSOUND.SYS driver, 65-68, 70, 393-394, 398, 402
PROAS.EXE driver, 70
running in Windows, 78
Sound Blaster emulation settings, 67, 69-70
DOS software, 130-135
bundled software, 373, 375, 378
Multimedia Kaleidescapes, 446-448, 455
Musicbox, 132-133
Playfile, 118, 134, 405-406
Recfile, 118, 134-135, 404, 405-406
running under Windows, 78, 211
TrakBlaster Pro, 131-132, 399
See also Microsoft Windows software; Monologue for DOS; Software; Utility software
Double-speed CD-ROM drives, 273-275
Dr. T's Music Software
address, 261
Boom Box, MIDI software, 229
QuickScore Plus, 229-230
Dragon Systems, 144, 160
Driver software, 62-88, 285-286, 297-302
AdLib drivers, 66, 409
AUTOEXEC.BAT settings, 63, 69-70
for CD-ROM drives, 285-286, 297-302, 394-397
in CONFIG.SYS file, 63
defined, 41
directories for, 64
DOS installation, 63, 65-76
DOS mixer program (PAS.EXE), 70-76, 405
DOS MVSOUND.SYS driver, 65-68, 70, 393-394, 398, 402
DOS PROAS.EXE driver, 70
DOS Sound Blaster emulation settings, 67, 69-70
installing, 62-88, 285-286, 297-302
installing manually, 392-393
installing Pro AudioSpectrum 16, 392-394
loading high, 392
MIDI music and, 103
MSCDEX.EXE CD-ROM driver, 297-300, 302, 394-397
overview of, 62-63
Quick Start program and, 63-65, 77
running DOS drivers in Windows, 78
SCSIworks! program, 276, 420-423
Sound Blaster drivers, 66, 409
troubleshooting Windows drivers, 401-404
TSLCDR.SYS CD-ROM driver, 297-302, 394-397
Windows Control Panel settings, 81, 82, 84-86
Windows DMA settings, 49, 84-85
Windows drivers, 77-78
Windows Drivers applet and, 82, 84-85
Windows installation, 77-88
Windows IRQ settings, 51, 52, 80, 84-85
Windows MIDI Mapper applet and, 85-86
Windows mixers (PROMIX.EXE and PMIX.EXE), 77, 78, 86-88
Windows MV.INI settings, 83-84
Windows MVMIXER.DRV driver settings, 83-84
Windows Sound Blaster emulation settings, 85
Windows SYSTEM.INI settings, 77, 79-81, 402
Windows WIN.INI settings, 77, 81
Drivers applet, Windows, 82, 84-85
Driving simulators, 342
DRQ (Data ReQuest line) latch jumper, 38
Drum channel, in synthesizers, 176

DSP (digital signal processing), 125-126
Dust doors, CD-ROM, 281
Dynamic range
  overview of, 95, 96
  sample size and, 106
Dynamix
  Aces of the Pacific, 220
  Aces over Europe, 220
  Front Page Sports: Football Pro, 224-225
  Red Baron, 220

E

Editing, digital audio, 39
Educational CD-ROM titles, 191-193, 259-260
  See also Music education software
8-bit digital audio
  8-bit ADPCM compression, 124
  versus 16-bit digital audio, 39, 106, 107
  PCMFun software, 460-461, 471-474
  TPCM software, 135, 460-461, 466-471, 473-474
8-bit sound cards
  Audio Port sound device, 21, 43, 44, 46, 376-378
  Thunder & Lightning, 48, 49, 376-378
  See also Thunder Board
EISA (Extended Industry Standard Architecture) bus, 44-45
11th Hour CD-ROM title, 200
Eliminator joystick card, 361-362
Embedding, objects, 140
Emulation
  Roland MPU-401, 40-41, 55, 56
  Sound Blaster, 67, 69-70, 85, 390, 391-392
  See also Compatibility
Encore software, 232
Encyclopedias, Compton's, 195-196, 375, 406
English, speech synthesis and, 145-147
Entertainment CD-ROM titles, 196-202, 257-258
  See also Game software
Equalization
  digital signal processing (DSP) and, 125-126
  fast Fourier transform (FFT), 118
  overview of, 116-118
Exception dictionaries, Monologue, 145-146, 147, 149, 151-152
ExecuVoice program, 152-162
  adding applications, 156-158
  alternatives to, 159-161
  microphones and, 162
  overview of, 152-153, 155-156
  speech recognition technology and, 153-154, 161-162
  tips and tricks, 158-159
  training, 154, 155, 158, 161-162
  using with Monologue 16 for Windows, 144-145
  See also InCube Voice Command software; Monologue; Speech; Speech recognition software
Extended Industry Standard Architecture (EISA) bus, 44-45
Extended-level synthesizers, 184-185
Extensions. *See* File formats
External CD-ROM drives, 284-285
External connectors, 33-35
  microphone input jack, 35, 387
  for multimedia systems, 33
  Speaker Out connector, 34, 336
  Stereo Line-In connector, 35, 386
  Stereo Line-Out connector, 34, 336, 386
  See also Connectors; MIDI/Joystick port
EZSound FX software, 248-249

F

F1-17 game, 410
F-15 Strike Eagle III game, 220
Falcon 3.0 game, 220, 221, 408

Fast Fourier transform (FFT) equalization, 118
Fast SCSI-2 standard, 416
Fidelity. *See* Sound quality
File formats, 108-111
  Audio Interchange File Format (.IFF), 108-109
  converting, 108
  Creative Music Format (.CMF), 109, 110, 248
  Microsoft interleaved audio/video files (.AVI), 139
  Microsoft Resource Interchange File Format (RIFF) (.RMI), 110, 139
  MIDI files (.MID), 109, 110, 132, 139, 183, 253, 256, 398
  .MOD files, 109-110, 131, 132, 399
  .ROL files, 110, 248, 398
  Sound Blaster instrument bank files (.IBK), 109
  Sound Blaster Instrument files (.SBI), 109
  sound blocks and, 108, 109, 110, 111, 121
  Sound Resource files (.SND), 110, 248
  Standard MIDI File Specification, 183
  Studio files (.SNG), 110, 183
  Turtle Beach file format (.SMP), 110
  Voice files (.VOC), 111, 121, 134, 135, 248, 250
  See also Wave files (.WAV)
Filters
  anti-aliasing, 40, 119-120
  loudness, 41
  low-pass input, 42, 118-119
  low-pass output, 42
  roll-off frequencies and, 119
  setting manually, 118
  smoothing, 40
Flashback game, 222
Flight simulation software, 220-222
  Aces of the Pacific, 220
  Aces over Europe, 220
  Comanche: Maximum Overkill, 221-222
  F-15 Strike Eagle III, 220
  Falcon 3.0, 220, 221, 408
  Microsoft Flight Simulator 5.0, 221, 222
  overview of, 220-222
  Red Baron, 220
  Strike Commander, 221
  X-Wing, 222
Flight simulator controls, 341-356
  CH FlightStick, 343-344, 345
  CH Virtual Pilot, 344-346
  Interface Dynamics joystick brackets, 353-354, 362
  Keyboard Commander keyboard templates, 354-355, 362
  purchasing, 355-356
  rudder controls, 341, 351-352
  throttle controls, 341
  ThrustMaster joysticks, 346-355, 362
  ThrustMaster cockpits, 352-353
  ThrustMaster Flight Control System (FCS), 347-349
  ThrustMaster Mark II Weapons Control System (WCS), 349-351, 360
  ThrustMaster Rudder Control System (RCS), 351-352
  See also Control pads; Joysticks
Floppy disks
  speakers and, 316
  speed of, 272
  troubleshooting installation, 64
  See also Hard disk drives; Software on book's diskette
FM synthesis, 101-102
  AdLib sound card and, 9
  limitations of, 102
  MIDI music and, 171-172
  two-operator, 101-102
  See also Waveguide synthesis; Wavetable synthesis
FM synthesizers
  carrier cell, 101-102
  melody sounds and, 101

MIDI music and, 171-172
versus MOD players, 131-132
modulator cell, 101-102
overview of, 4, 40, 101-102
percussion sounds and, 101
port addresses and, 55
See also MIDI sequencers; Synthesizers
Formant frequencies, 154, 161
Formats. *See* File formats
486 computers, 392
Fourier analysis, of waveforms, 115-118
Freezes
INSTALL and, 392
Monologue and, 399
Quick Start and, 64
Frequency
bandwidth and, 97-98
CD audio quality and, 106
defined, 93, 94, 95
formant frequencies, 154, 161
fundamental frequency, 116, 117
Nyquist limit frequency, 119
pitch and, 95, 311-312
roll-off frequencies, 98, 119
speakers and, 311-312
speech recognition software and, 154
Frequency response specifications, for speakers, 311-312
Front Page Sports: Football Pro game, 224-225
Full-duplex MIDI controllers, 40
Full-motion video cards, 24
Fundamental frequency, 116, 117
Fusion multimedia upgrade kits
CD-ROM interface, 37
directory for software, 64
overview of, 13-14, 290, 368-369, 373-375, 379
Future Trends Software, EZSound FX, 248-249, 261

G

Game Blaster sound card, 9
Game software, 219-226
action games, 222-223
adventure games, 223
developer's conferences and kits, 430-431
flight simulation games, 220-222
magazines about, 417-418
music and sounds for, 300-301
on CD-ROM, 196-202, 257-258
on-line services and, 426-428
running in DOS under Windows, 78
sound cards and, 6, 8-9, 20-21, 40
speakers and, 317-318
sports games, 223-225
strategy games, 225-226
troubleshooting, 404
See also Control pads; Flight simulator controls; Joysticks
Game software control pads, 356-359
GameCard III joystick card, 361-362
General MIDI standard, 175, 183-185
Grounding, installation and, 57
Gunship 2000 game, 410

H

Hard disk drives
CD-ROM titles and, 206-208
digital audio storage and, 106-107
disk-doubler software, 107, 206-207
SCSIworks! program and, 420
space requirements, 392
speed of, 272
troubleshooting, 411
See also Floppy disks
Hardball III game, 225
Hardware. *See* Installing hardware
Hardware caches, 303
Hardware compression, 386
Hardware configuration labels, 58-59
Harmonics, 101, 116, 117

Headphones
output on speakers for, 315
versus speakers, 308
Hertz (Hz), 41, 94
High memory, 56
Hiss, reducing, 75
Hot keys, for volume control, 65, 87
Howling Dog Systems, Power Chords, 227-228, 261
Human voice
male opera singing voice, 116
See also Speech; Speech recognition software
Hyperlinks, 195-196

I

I/O port addresses, 52-55, 56, 390, 391
Ibis Software
address, 261
NotePlay, 239-240
Play It By Ear, 240-242
RhythmAce, 1028-1029
RhythmPlay, 243
Soloist, 243-245
SoundSculptor, 250
.IBK files, 109
IBM OS/2 driver software, 63, 411
IBM VoiceType Control program, 160
ICs (integrated circuits). *See* Chips
Id Software, Wolfenstein 3D, 222, 410
.IFF files, 108-109
I-Motion, Alone in the Dark game, 223
Impedance ratings
microphone, 35
speaker, 309-310
IN MIDI sockets, 170-171
InCube Voice Command software, 152, 442-446
address for, 455
disabling voice recognition, 444-445
installing, 440
issuing voice commands, 445-446
saving voice templates, 444
speaking to, 445
starting, 442
strengths and weaknesses, 446
training commands, 442-444
See also ExecuVoice program; Speech recognition software
Indiana Jones: Fate of Atlantis game, 223, 224, 257
Industry Standard Architecture (ISA) bus, 43-44, 45, 46
Input filter, low-pass, 42, 118-119
INSTALL program
determining DMA and IRQ settings with, 387
troubleshooting, 392-393
Installing
7th Guest, 201
Arthur's Teacher Trouble, 193
Battle Chess Enhanced CD-ROM, 199
Civilization, 202
Compton's Interactive Encyclopedia, 196
Mantis Experimental Fighter, 201, 375
Mayo Clinic Family Health Book, 194-195
PC Karaoke, 198
Pocket CD program, 136
Recfile software, 134-135
software on book's diskette, 438-441
Sound Impressions program, 138-139
TrakBlaster Pro, 132, 399
Where in the World Is Carmen Sandiego?, 192
Installing driver software. *See* Driver software
Installing hardware, 32-59, 284-286, 295-297
bus architecture and, 42-46
for CD-ROM drives, 284-286, 295-297
chips and, 38-42
external connectors and, 33-38
grounding and, 57
hardware configuration labels, 58-59

ideal settings, 56
internal connectors and, 35-38
with other cards, 46-47
port addresses and, 52-55, 56
Pro AudioSpectrum 16 sound card, 391-392
Quick Start program and, 32, 46, 50-51, 56
tools and procedures for, 57-58
upper memory and, 55-56
See also DMA channels; IRQs (interrupt requests)
Instruments. *See* FM synthesizers; MIDI sequencers; Musical instruments; Synthesizers
Integrated circuits (ICs). *See* Chips
Integrated multimedia systems. *See* Multimedia systems
Interactive Ventures, Mayo Clinic Family Health Book, 193-195, 375
Interface Dynamics joystick brackets, 353-354, 362
Interleaved audio/video files (.AVI), 139
Internal audio (CD) connector, 37, 387
Internal CD-ROM drives, 284-285
Internal connectors, 35-38
Board ID jumper, 37-38
DRQ (Data ReQuest line) latch jumper, 38
internal audio (CD) connector, 37, 387
internal speaker connector, 37
overview of, 35-36
SCSI connectors, 37, 283, 284-285, 296, 386
See also Connectors
Internal speaker connector, 37
International MIDI Association, 183, 430
Internet newsgroups, 428
Interplay
Battle Chess Enhanced CD-ROM, 198-199, 212, 375
Buzz Aldrin's Race Into Space, 225-226
Out Of This World, 222
Star Trek: The 25th Anniversary game, 409
IRQs (interrupt requests), 51-52, 386
CONFIG.SYS settings, 51-52
default settings, 389-390
determining settings, 387-388
ideal settings, 56
IRQ conflicts, 391
setting jumpers for, 46-47, 391
for Sound Blaster emulation, 390, 391
TrakBlaster Pro settings, 132, 399
troubleshooting settings, 389-392, 395, 399, 402
for Windows drivers, 84-85, 402
ISA (Industry Standard Architecture) bus, 43-44, 45, 46

J

Joystick cards
R&R Electronics EPIC, 359-360, 362
speed-compensating, 356, 361-362
Joystick port
overview of, 35, 36, 341, 387
port addresses for, 55
troubleshooting conflicts, 360-361
Joysticks, 340-362
Advanced Gravis PC GamePad, 356-357, 362
calibrating, 356, 361
centering, 342, 361
CH Products simulator controls, 342-346, 362
cockpits, 352-355
connecting, 35, 36
connecting multiple, 341, 359-360, 362
control pads, 356-359
flight simulator controls, 341-356
Interface Dynamics joystick brackets, 353-354, 362

Keyboard Commander keyboard templates, 354-355, 362
multimedia uses for, 359
overview of, 340-342
purchasing simulator controls, 355-356
rudder controls, 341, 351-352
Suncom Command Control, 358, 362
throttle controls, 341
ThrustMaster simulator controls, 346-355, 362
trim controls, 342
troubleshooting, 360-362, 407
virtual reality and, 359-360
Jumpers
Board ID jumper, 37-38
for DMA and IRQ settings, 46, 391
DRQ (Data ReQuest line) latch jumper, 38
Sound Blaster emulation, 67
See also Internal connectors
Just Grandma and Me CD-ROM title, 259

K

Key Maps, MIDI Mapper applet, 186-187
Keyboard Commander keyboard templates, 354-355, 362
Keyboard shortcuts, 65, 87
Keyboard synthesizers, 166
Kilohertz (KHz), 94
King's Quest game, 223, 258, 410
Kodak Photo CDs, 279
Koss speakers, 318-319, 321, 335

L

Labtec Enterprises
microphone, 336
speakers, 318-319, 322, 335
Lands of Lure game, 200
Laptop bus architecture, 45-46
Large scale integrated (LSI) circuits, 268
Lawrence Productions games, 409
Lens cleaners, CD-ROM, 281
LHARC program, 107, 120, 207
LHX game, 409
Lightning CD cache, 303-304
Linear pulse code modulation (LPCM) system, 121-122
Line-In connector, 35, 386
Line-Out connector, 34, 336, 386
Linking, objects, 140
Links, The Golf Game, 408
LinksPro 386 game, 223-224
Local bus architecture, 45
Lock-ups
INSTALL and, 392
Monologue and, 399
Quick Start and, 64
Looping, sound blocks, 108, 111
Lossless versus lossy compression techniques, 123-124
Lotus 1-2-3 for Windows with Multimedia Help, 400
Loudness filters, 41
Low-pass input filter, 42, 118-119
Low-pass output filter, 42
LPCM digital audio, 121-122
LSI (large scale integrated) circuits, 268
LucasArts
Day of the Tentacle, 257-258
Indiana Jones: Fate of Atlantis, 223, 224, 257
Monkey Island 2, 223
X-Wing, 222
Lucid Corporation, Lightning CD cache, 303-304

M

Machine dictation software, 152, 153, 162
Macintosh computers
Audio Interchange File Format (.IFF), 108-109
digital signal processing (DSP) on, 126

Pro AudioSpectrum 16 Macintosh sound card, 435
Sound Resource files (.SND), 110, 248
Macromedia Action!, 202-203, 212, 375
Maddox, Gary, 248, 260
Magazines, 429-430
Magnetic fields
CD-ROM drives and, 271
of speakers, 315-316
Magneto-optical drives, 420
Male opera singing voice, 116
Mantis Experimental Fighter, 201, 375
Masque Publishing, Multimedia Kaleidescapes, 446-448, 455
Master Tracks MIDI sequencer, 233-234
Mayo Clinic Family Health Book, 193-195, 375
MCA (Micro Channel Architecture) bus, 44
Mean Time Between Failure (MTBF) specification, 281-282
Media Player software, 139, 171, 404
Media Vision, 13-28
ASIC chip development, 19
buying direct from, 367-368
conferences, 430-431
Creative Labs lawsuit and, 22-23
Customer Service, 32, 367-368, 384-385
developer's kits, 102, 431
game software and, 20-21
history of, 14-28
marketing strategy, 15-17
.MOD files and, 109-110
on-line forums, 426-428
.ROL files and, 110
stock market symbol for, 23
telephone numbers, 32, 366, 367, 384
See also Bulletin board systems; Technical Support
Media Vision products, 368-380, 386-387
16-bit sound cards, 368, 369-373, 386-387
Audio Port sound device, 21, 43, 44, 46, 376-378
bundled software, 372-373, 374-375, 377-378
Captain Crunch software, 27
CDPC multimedia systems, 21, 317, 376-378
CD-ROM cable/driver kits, 285-286
CD-ROM titles, 256
Customer Service, 32, 367-368, 384-385
developer's kits, 102, 431
for Macintosh computers, 380, 435
Midi Mate MIDI connector box, 35, 36, 169-170, 341, 380, 398
MotiVE video chip set, 27
overview of, 368-369
Pellucid video cards, 23-24, 27
Pro AudioSpectrum 16 Macintosh sound card, 435
Pro Graphics 1280 accelerator, 434
Pro MovieSpectrum video capture board, 27, 434
Pro Studio PowerPak software upgrade, 144, 368
purchasing, 367-368
Quick Tour multimedia introduction, 168
SCSI port on, 419
software on bulletin board system, 66, 132, 135
sound and music software, 370-371
Thunder & Lightning sound card, 48, 49, 376-378
video software and hardware, 23-24, 26-28, 434
See also Bulletin board systems; DOS software; Microsoft Windows software; Multimedia upgrade kits; *all Pro Audio sound card entries*; Technical Support; Thunder Board; Troubleshooting
Media Vision Resources, 367-368
Megahertz (MHz), 43
Melody channels, in synthesizers, 175-176
Memory
CD-ROM drives and, 299-300

CD-ROM titles and, 206, 211
digital audio and, 106-107
high memory, 56
installation and upper, 55-56
loading driver software high, 392
parity errors, 391
ROM/UMB memory address, 56
Memory-resident programs (TSRs)
driver software, 63
Musicbox, 132-133
Memphis multimedia upgrade system, 27-28
Micro Channel Architecture (MCA) bus, 44
Microphone Input jack, 35, 387
Microphones, 336-337
bandwidth and, 99
equalization and, 116-117
ExecuVoice and, 162
impedance ratings, 35
Pro AudioStudio 16 sound card, 35, 336
purchasing, 336-337
Recfile software and, 134-135
sampling and, 104, 107
sound recording and, 94
speech recognition software and, 337
supported, 387
See also Recording
Microprose
Civilization game, 202, 375
F1-17 game, 410
F-15 Strike Eagle III, 220
Gunship 2000 game, 410
Microsoft Corporation
Authoring Guidelines, 184-185
Cinemania CD-ROM title, 258, 259
Flight Simulator 5.0 game, 221, 222
Microsoft Sound System, 24
MPC standards and, 10-14
Multimedia Beethoven: The Ninth Symphony, 258
Microsoft interleaved audio/video files (.AVI), 139
Microsoft Windows
DMA settings and, 49, 84-85
file formats for, 108, 110, 111, 134
ideal settings for, 56
installing book's software in, 439-441
IRQ settings and, 51, 52, 80, 84-85
Multimedia Extensions for Windows, 20
multitasking, 204-205
Resource Interchange File Format (RIFF) (.RMI), 110, 139
running DOS software in, 78, 211
troubleshooting CD-ROM titles for, 208-211
See also Wave files (.WAV)
Microsoft Windows driver software, 77-88
Control Panel settings, 81, 82, 84-86
directories for, 64
DMA settings and, 49, 84-85, 402
Drivers applet and, 82, 84-85
IRQ settings, 51, 52, 80, 84-85, 402
MIDI Mapper applet and, 85-86
mixers (PROMIX.EXE and PMIX.EXE), 77, 78, 86-88
MV.INI settings, 83-84
MVMIXER.DRV driver, 83-84
overview of, 63, 77-78
running DOS drivers in Windows, 78
Sound Blaster emulation settings, 85
SYSTEM.INI settings, 77, 79-81, 402
troubleshooting, 401-404
WIN.INI settings, 77, 81
Microsoft Windows NT driver software, 63
Microsoft Windows software, 130, 135-141
bundled software, 372, 374, 377
InCube Voice Command, 152, 440, 442-446, 455
Media Player, 139, 171, 404
Microsoft Write, 140-141
MIDI Jukebox, 171, 440, 450-451, 455
MIDI Mapper, 85-86, 185-187
MidiKeys, 440, 448-450, 455
MS Bookshelf, 258, 406
Object Linking and Embedding (OLE) and, 139-141
Pocket CD, 136
Pocket Recorder, 107, 123, 125, 136-137, 140-141, 403-404

Sound Bits, 135
Sound Impressions, 137-139
Talking Slideshow, 440, 452-453, 455
Whoop It Up!, 246-247, 260, 440, 453-454, 456
See also DOS software; ExecuVoice; Monologue 16 for Windows; Software
MIDI cables, 171
MIDI channel numbers, 173
MIDI controllers
bidirectional and full-duplex, 40
defined, 172
overview of, 4, 40-41
Roland MPU-401 emulation, 40-41, 55, 56, 67-68, 386
MIDI devices
connecting to PCs, 35, 36
daisy-chaining, 170-171
defined, 169
MIDI Mapper applet and, 185-186
MIDI files (.MID), 109, 110
copyrights and, 168
versus digital audio files, 168
libraries of, 253, 256
Media Player and, 139
MIDI Jukebox and, 450-451
in Recording Session, 183
Standard MIDI File Specification, 183
troubleshooting, 398
Whoop It Up! software and, 246-247, 260, 440, 453-454, 456
MIDI instruments, 167
MIDI Jukebox software, 171, 440, 450-451, 455
MIDI language
audio technology and, 103
copyrights and, 168
Note On message, 168, 173-174
note values, 173-174
overview of, 166-168
Program Change command, 168, 175
waveguide synthesis and, 125
MIDI Mapper applet, 85-86, 185-187
example, 187
Key Maps, 186-187
non-General MIDI synthesizers and, 183, 184, 185-186
Patch Maps, 186
Setup Map, 186
Midi Mate MIDI connector box, 35, 36, 341, 380, 398
creating MIDI networks with, 169-170
MIDI networks, 169-172
cables, 171
components in, 169-170
daisy-chaining MIDI devices, 170-171
MIDI sequencers
Cakewalk Professional, 237-238
connecting to MIDI networks, 171
Master Tracks, 233-234
MIDI controllers and, 40, 172
overview of, 168, 172
Power Chords, 227-228
QuickScore Plus, 229-230
Sequencer Plus, 110, 238
Trax MIDI sequencer, 25, 234
WinJammer, 238-239
See also Recording Session sequencer program; Synthesizers
MIDI sockets, 170-171
MIDI software, 226-239
Band-in-a-Box Pro, 234-235
Boom Box, 229
Cakewalk Professional, 237-238
Encore, 232
Master Tracks, 233-234
MusicTime, 231-232
Power Chords, 227-228
QuickScore Plus, 229-230
Sequencer Plus series, 110, 238
Studio for Windows, 230-231
SuperJAM!, 226-227
Trax, 25, 234
WinJammer, 238-239
WinSong, 236
See also Music education software

MIDI standards, 6-8, 182-185
General MIDI standard, 175, 183-185
International MIDI Association, 183, 430
Microsoft Authoring Guidelines, 184-185
MIDI Specification 1.0, 167, 183
MPC standards and, 175, 184-185
Standard MIDI File Specification, 183
MIDI synthesizers. *See* Synthesizers
MIDI tutorial, 176-182
MIDI/Joystick port
overview of, 35, 36, 341, 387
port addresses for, 55
troubleshooting conflicts, 360-361
MidiKeys software, 440, 448-450, 455
MIDIMAP.CFG file, 187
Midisoft Corporation
address, 261
Multimedia Music Library, 253-254
Music Mentor for Windows, 245
Recording Session, 108, 110, 176-182, 245-246
Studio files (.SNG), 110, 183
MidPak programming tools, 253
Milliseconds (ms), 271
Mixed Up Mother Goose CD-ROM title, 260
Mixer programs
digital signal processing (DSP) and, 125-126
overview of, 31-32
PAS.EXE, 70-76, 405
PROMIX.EXE and PMIX.EXE, 77, 78, 86-88, 402
settings for CD-ROM drives, 300-301
See also Pocket Recorder
.MOD files, 109-110, 131, 132, 399
MOD players, 109-110, 131-132
Modems
Battle Chess CD-ROM and, 198-199
IRQ settings and, 52
Monitors, speakers and, 315-316
Monkey Island 2 game, 223
Monologue for DOS, 145-149
directory for, 147
exception dictionary, 145-146, 147, 149
exiting, 148
MONO program, 147-148
overview of, 145-147
SAYFILE program, 147, 149, 400
screen savers and, 147
troubleshooting, 399-400
See also ExecuVoice program; Speech; Speech recognition software
Monologue 16 for Windows, 145-147, 149-152
accessing icon for, 151
DLL interface, 152
exception dictionary, 145-146, 151-152
overview of, 145-147, 149
screen savers and, 147
tips and tricks, 150-152
troubleshooting, 399-400
tutorial, 149-150
using with ExecuVoice, 144-145
Morphing, 27
Motherboards, DMA settings and, 48
MotiVE video chip set, 27
Mouse, IRQ settings and, 52
MPC standards, 10-14
CD-ROM drives and, 12, 273, 276-279
Level 1 versus Level 2, 11-12
MIDI standards and, 175, 184-185
multimedia systems and, 13-14
sample size and, 106
for synthesizers, 175, 184-185
testing and, 279
MPU-401 emulation, 40-41, 55, 56, 386
MVSOUND.SYS parameters, 67-68
Mr. Sound FX software, 250
MS Bookshelf program, 258, 406
MSCDEX.EXE CD-ROM driver, 297-300, 302, 394-397
MTBF (Mean Time Between Failure) specification, 281-282
Multidisc CD-ROM changers, 288-289

Multimedia Beethoven: The Ninth Symphony, 258
Multimedia controller, 39, 41
Multimedia Extensions for Windows, 20
Multimedia Kaleidescapes software, 446-448, 455
Multimedia Music Library, 253-254
Multimedia PC Marketing Council, 430
See also MPC standards
Multimedia presentations, 202-203, 212
Talking Slideshow, 440, 452-453, 455
Multimedia systems
CDPC multimedia systems, 21, 317, 376-378
external connectors for, 33
joysticks and, 359
MPC standards and, 13-14
overview of, 13-14, 26-28
Multimedia Toolkit software, 251
Multimedia upgrade kits
16-bit multimedia kits, 368-369, 373-375
CD-ROM Multimedia Kit for Macintosh, 435
CD-ROM titles and, 216-217
Memphis multimedia upgrade system, 27-28
Pro 16 Multimedia System, 21, 373-375, 379
purchasing, 283
See also CD-ROM drives; CD-ROM titles; Fusion multimedia upgrade kits
Multitasking, CD-ROM titles and, 204-205
Music education software, 239-246
Music Mentor for Windows, 245
NotePlay, 239-240
Play It By Ear, 240-242
RhythmAce, 1028-1029
RhythmPlay, 243
Soloist, 243-245
See also MIDI software
Music Mentor for Windows software, 245
Musical instruments
MIDI instruments, 167
waveforms of, 114-115
waveguide synthesis and, 124-125
wavetable synthesis and, 24, 25, 102-103
Musicbox program, 132-133
MusicBytes software, 254-255
MusiClips software, 256
MusicTime software, 231-232
MV.INI settings, 83-84
MVMIXER.DRV driver, 83-84
MVSOUND.SYS driver, 51-52, 65-68, 393-394
DMA and IRQ settings, 388
latest version of, 66
loading in CONFIG.SYS, 51-52, 66-68, 398
overview of, 65-66, 393-394
Roland MPU-401 emulation parameters, 67-68
Sound Blaster emulation parameters, 67
timer parameter, 68
troubleshooting, 393-394

N

National Geographic, President's Starting with George program, 406
NEC MultiSpin CD-ROM drives, 287-288, 294, 305
Network cards
DMA settings for, 50
IRQ settings for, 52
Noise
defined, 99
speech recognition and background, 153, 162
unamplified signals and, 34
See also Distortion
Norton Desktop for Windows
CD-ROM titles and, 210
Pro AudioStudio 16 and, 78
Norton SpeedCache Plus, 304
Note On message, MIDI, 168, 173-174

Note values, MIDI and, 173-174
NotePlay software, 167, 239-240
Nova Logic, Comanche: Maximum Overkill, 221-222
Nyquist limit frequency, 119
Nyquist theorem, 105, 107, 119-120

O

Object Linking and Embedding (OLE), 139-141
  inserting sound files in word processor documents, 140-141
  overview of, 139-140
  WIN.INI settings for, 81
Ohms, impedance ratings and, 35, 309-310
On-line forums, 426-428
Opera singing voice, male, 116
Organizations, 430
Origin, Strike Commander, 221
OS/2 driver software, 63, 411
OUT MIDI sockets, 170-171
Out Of This World game, 222
Output filter, low-pass, 42

P

Parity errors, 391
PAS16D1.ZIP file, 135
PAS.EXE mixer program, 70-76, 405
  command line mode, 70-75
  interactive mode, 76
Passport Designs
  address, 261
  Encore, 232
  Master Tracks, 233-234
  MusicTime, 231-232
  Studio for Windows, 230-231
  Trax MIDI sequencer, 25, 234
Patch assignments, in synthesizers, 175
Patch Maps, MIDI Mapper applet, 186
PatchView FM software, 252
PC Karaoke, 196-198, 375
PC magazine, 429
PC Speaker sound, 386
PCI (Peripheral Component Interconnect), 45
PCM (pulse code modulation) circuitry
  aliasing and, 119
  ExecuVoice, Monologue 16 and, 144-145
  input filters and, 118-119
  overview of, 39-40, 47
PCMCIA cards and connectors, 46
PCMFun software, 460-461, 471-474
Pellucid video cards, 23-24, 27
Percussion channel, in synthesizers, 176
Percussion sounds, 101
Performance
  of CD-ROM titles, 204-208
  See also Speed
Peripheral Component Interconnect (PCI), 45
Persona Technologies speakers, 323, 326-327, 335
Personal Computer Memory Card International Association (PCMCIA) cards and connectors, 46
PG Music, Band-in-a-Box Pro, 234-235, 261
Photo CDs, Kodak, 279
Pioneer CD-ROM drives, 275, 281, 288-290
Pitch, 95, 173, 174, 311
PKZIP program, 107, 120, 207, 429
Play It By Ear software, 240-242
Playback software
  Boom Box, 229
  Media Player, 139, 171, 404
  MIDI Jukebox, 171, 440, 450-451, 455
  MOD players, 109-110, 131-132
  Playfile, 118, 134, 405-406
  Pocket CD, 136
  Studio for Windows, 230-231
  TPCM, 135, 460-461, 466-471, 473-474
  TrakBlaster Pro, 109-110, 131-132, 399
  WinSong, 236

Playing
audio CDs in CD-ROM drives, 132-133
sound files from AUTOEXEC.BAT file, 134
Playroom Software, MidiKeys, 440, 448-450, 455
Pocket CD program, 136
Pocket Mixer program (PMIX.EXE), 77, 78, 86-88, 402
Pocket Recorder, 136-137
compression techniques, 107, 123
OLE and, 140-141
special effects, 125
troubleshooting, 402, 403-404
Pocket-Sized Software, MIDI Jukebox, 171, 440, 450-451, 455
Polyphony, synthesizers and, 175-176, 184-185
Ports
I/O port addresses, 52-55, 56, 390, 391
SCSI, 414, 419, 422
See also MIDI/Joystick port
Power Chords MIDI sequencer, 227-228
Power output (wattage), of speakers, 312-313
Powered speakers, 309-310, 336
PowerPak software upgrade, 144, 368
Power-saving circuits, for speakers, 317-318
Presentations, 202-203, 212
Talking Slideshow, 440, 452-453, 455
Prince of Persia 2 game, 223
Printer controllers, DMA settings for, 50
Pro 16 Multimedia System, 21, 373-375, 379
Pro Audio sound cards, 368-373, 386-387
amplifiers in, 309-310
CD-ROM drive compatibility, 275-276, 277, 286
CD-ROM drives and, 4, 283
overview of, 368-373, 386-387
SCSI port, 419
size of, 386
sound enhancement circuits, 314
See also Media Vision products; Troubleshooting
Pro Audio 16 Basic sound card, 25, 370-373
software bundled with, 370-371, 372-373
Pro AudioSpectrum Developer's Kit, 102, 431
Pro AudioSpectrum sound card, 378-379
CD-ROM interface, 37
chip set for, 39
DMA settings for, 48, 49
DOS version, 20
FM synthesizer on, 101
game software and, 20-21
history of, 17, 19-21
internal speaker connector, 37
IRQ settings for, 53
overview of, 5, 378-379
Pro AudioSpectrum 16 sound card, 369, 370-373
in 486 computers, 392
bandwidth of, 98
CD-ROM interface, 37
chip set for, 38-42
compatible cards, 380
directory for software, 64
DMA settings for, 49
FM synthesizer on, 101
installing driver software, 392-394
installing hardware, 391-392
internal speaker connector, 37
IRQ settings for, 53
overview of, 4-5, 369, 370-373
port addresses and, 55
software bundled with, 370-371, 372-373
versus Sound Blaster 16 ASP, 24-25
Sound Blaster emulation settings, 67, 390
speech software for, 144
Pro AudioSpectrum 16-compatible cards, 380
Pro AudioSpectrum 16 Macintosh sound card, 435

Pro AudioSpectrum Plus sound card
CD-ROM interface, 37
DMA settings and, 48
FM synthesizer on, 101
overview of, 379
Sony CD-ROM drives and, 290
Pro AudioStudio 16 sound card, 369-373
bandwidth of, 98
directory for software, 64
DMA settings for, 48
microphone, 35, 336
MPU-401 emulation settings, 67, 386
Norton Desktop for Windows and, 78
overview of, 25, 26, 369-373
Quick Tour multimedia introduction, 168
software bundled with, 370-371, 372-373
Sound Blaster emulation settings, 67, 390
speech software for, 144
Stereo Line-Out connector, 34, 336, 386
See also Pocket Recorder
Pro AudioStudio 16XL sound card, 370-373
MPU-401 emulation settings, 67, 386
overview of, 25, 370-373
Quick Tour multimedia introduction, 168
software bundled with, 370-371, 372-373
Sound Blaster emulation settings, 67, 390
Stereo Line-Out connector, 34, 336, 386
wavetable synthesis and, 103
See also Pocket Recorder
Pro Graphics 1280 accelerator, 434
Pro Mixer program (PROMIX.EXE), 77, 78, 86-88, 402
Pro MovieSpectrum video capture board, 27, 434
Pro Studio PowerPak software upgrade, 144, 368
PROAS.EXE driver, 70
Productivity CD-ROM titles, 202-203
Program Change command, MIDI, 168, 175
Programming tools, 252-256
DigPak, 253
MidPak, 253
Multimedia Music Library, 253-254
MusicBytes, 254-255
MusiClips, 256
Sound Factory, 255-256
See also Utility software
Programs. *See* CD-ROM titles; DOS software; Driver software; Microsoft Windows software
PROGRAMS.LZH file, 135
PROMIX.EXE mixer program, 77, 78, 86-88, 402
Prosonus
address, 262
Mr. Sound FX, 250
MusicBytes, 254-255
Pulse code modulation (PCM) circuitry, 39-40, 47
Purchasing
CD-ROM drives, 282-295
flight simulator controls, 355-356
Media Vision products, 367-368
microphones, 336-337
SCSIworks! program, 423
speakers, 318, 334-335

Q

Quantization errors, 124
Quantum Gate CD-ROM title, 256
Questions and answers. *See* Troubleshooting
Quick Start program, 63-65, 77
DMA settings, 46, 50-51, 64-65
effectiveness of, 32
ideal settings and, 56
IRQ settings, 46, 64-65
lock-ups and, 64
QUICK subdirectory, 207
QuickScore Plus software, 229-230

R

Radio Shack speakers, 318-319
Rainbows, 118
RAM buffers, CD-ROM drive, 273, 303
Real-time 16-bit audio
  compression/decompression, 123
Recfile program, 118, 134-135, 404, 405-406
Recording
  aliasing and, 119-120
  dynamic range and, 96
  equalization and, 116-118
  fast Fourier transform (FFT) equalization, 118
  input filters and, 118-119
  troubleshooting, 402-403
  See also Audio compression/decompression; Digital audio; Microphones; Sampling
Recording Session sequencer program, 108, 110, 176-182, 245-246
  Studio files (.SNG), 110, 183
Recording software
  Recfile, 118, 134-135, 404, 405-406
  Sound Impressions, 137-139
  TPCM, 135, 460-461, 466-471, 473-474
  WinSong, 236
  See also Pocket Recorder
Red Baron game, 220
Reference CD-ROM titles, 193-196, 258-259
Removable-media drives, 420
Resource Interchange File Format (RIFF) (.RMI), 110, 139
Reverberation, 126
RhythmAce software, 1028-1029
RhythmPlay software, 243
RIFF (Resource Interchange File Format) (.RMI), 110, 139
.RMI files, 110, 139
Robin Hood, The Legend of the Long Bow game, 409
.ROL files, 110, 248, 398
Roland MPU-401 emulation, 40-41, 55, 56, 386
  MVSOUND.SYS parameters, 67-68
Roll-off frequencies, 98, 119
ROM/UMB memory address, 56
Rudder controls, 341, 351-352
Running
  DOS CD-ROM titles in Windows, 211
  DOS drivers in Windows, 78

S

S/N ratio, 99
Sampling, 103, 104-107
  analog-to-digital conversion (ADC) and, 103, 104
  audio compression and, 121-122
  bandwidth and, 107
  CD audio quality and, 106
  digital-to-analog conversion (DAC) and, 103-104, 105
  input filters and, 118-119
  limitations of, 106-107
  Nyquist limit frequency and, 119
  Nyquist theorem and, 105, 107, 119-120
  sample size, 105, 106-107
  wavetable synthesis and, 103
  See also Audio compression/decompression; Digital audio
Sampling rate, 104, 105-106, 107
  aliasing and, 119-120
  Nyquist limit frequency and, 119
  setting manually, 118
  .WAV files and, 134
Satellite speakers, 328
SAYFILE program, Monologue for DOS, 147, 149, 400
.SBI files, 109
SBSOUND.COM driver, Creative Labs, 409
Scaling factors, 122
Scanner cards, 50
Scanners, 420

Screen savers, Monologue programs and, 147
SCSI addresses (IDs), 417
SCSI bus, 414
SCSI cables, 414, 415, 417-418, 419
SCSI connectors, 37, 283, 284-285, 296, 386, 415
SCSI controllers
  CD-ROM drives and, 41, 276, 394-397
  DMA settings for, 50
  overview of, 41
SCSI devices, 414-415, 417-418, 420-421
SCSI host adapters, 414, 415, 417
SCSI ports, 414, 419, 422
SCSI standards, 414-419
  Advanced SCSI Programming Interface (ASPI) protocol, 421-422
  Common Access Method (CAM) protocol, 421
  Fast and Wide SCSI-2, 416
  overview of, 414-415
  SCSI-1, 415-416, 419
  SCSI-2, 416, 419
  SCSI-2 Common Command Set (CCS), 416
  SCSI-3, 417
SCSI terminators, 417-418
SCSIworks! program, 276, 420-423
  ASPI protocol and, 421-422
  compatible SCSI devices, 420-421
  purchasing, 423
  technical specifications, 423
  See also Driver software
SDKs (software developer's kits), 102, 431
SDLC (Synchronous Data Link Controller), DMA settings and, 50
Seek time (CD-ROM), 271-272
Self-amplified speakers, 310
Semiconductor lasers, 268
Sequencer Plus sequencer program, 110, 238, 398-399
Sequencers. *See* MIDI sequencers; Recording Session sequencer program
Servers, OLE, 140
Setup Map, MIDI Mapper applet, 186
7th Guest, 199-201, 213, 257, 375
Sherlock Holmes game, 410
Shortcut keys, 65, 87
Sierra On-Line
  King's Quest, 223, 258, 410
  Mixed Up Mother Goose, 260
  Space Quest, 258
Signals, defined, 94
Signal-to-noise (s/n) ratio, 99
Silence blocks, 121
Silicon Graphics Inc. (SGI), 23
Simulation software. *See* Flight simulation software; Flight simulator controls
Sine waves, 94, 115-118
Singing voice, male opera, 116
Sirius Publishing, PC Karaoke, 196-198, 212, 375
16-bit digital audio
  16-bit audio CODEC chip, 39-40, 42
  versus 8-bit digital audio, 39, 106, 107
  CmpWav compression software, 460, 463-466
  compressing, 123
  TPCM software, 135, 460-461, 466-471, 473-474
  See also Digital audio
16-bit sound cards, 368-373
  DMA settings for, 49
  IRQ settings for, 53
  overview of, 4-5
  port addresses and, 55
  slots for, 43-44, 45
  See also Media Vision products; Sound cards; *all Pro Audio 16 sound card entries*
Slots, for cards, 43-44, 45
Smoothing filters, 40
.SMP files, 110
.SND files, 110, 248
.SNG files, 110, 183
Softline, Inc., Talking Slideshow, 440, 452-453, 455
Softronics, WinSong, 236, 262

Software, 218-262
action games, 222-223
adventure games, 223
educational CD-ROM titles, 191-193, 259-260
entertainment CD-ROM titles, 196-202, 257-258
MIDI software, 226-239
music education software, 239-246
on Media Vision bulletin board system, 66, 132, 135
productivity CD-ROM titles, 202-203
programming tools, 252-256
reference CD-ROM titles, 193-196, 258-259
simulation games, 220-222
software developer's kits (SDKs), 102, 431
sports games, 223-225
strategy games, 225-226
utility software, 246-252
See also CD-ROM titles; DOS software; Driver software; Media Vision products; Microsoft Windows software
Software on book's diskette, 438-456, 460-474
CmpWav, 460, 463-466
InCube Voice Command, 152, 440, 442-446, 455
installing, 438-441, 462
MIDI Jukebox, 440, 450-451, 455
MidiKeys, 440, 448-450, 455
Multimedia Kaleidescapes, 446-448, 455
PCMFun, 460, 471-474
publishers of, 19-18-20
Talking Slideshow, 440, 452-453, 455
TPCM, 135, 460, 466-471, 473-474
Whoop It Up!, 246-247, 260, 440, 453-454, 456
Software caches
for CD-ROM drives, 303-304
types of, 303
Software developer's kits (SDKs), 102, 431
Software publishers
for CD-ROM titles, 211-213
of software on book's diskette, 454-456
for software titles, 260-262
Software Toolworks, Space Shuttle, 258-259
Software vendors, of CD-ROM software, 294-295
Soloist software, 243-245
Sony Corporation
CD-ROM drives, 290-291, 395
speakers, 323-324, 327-328, 335
Sound, 93-100
amplitude, 94, 95-96, 121-122
bandwidth measurement, 97-99
CD audio, 39, 100, 106, 300-301, 385
characteristics of simple waves, 93-94
decibels (dB), 95-96, 99, 312-313
digital audio, 385
distortion, 99-100, 119-120, 313
dynamic range, 95, 96, 106
fundamental frequency, 116, 117
harmonics, 101, 116, 117
hertz (Hz), 41, 94
kilohertz (KHz), 94
melody sounds and, 101
microphones and, 94
noise, 99
overview of, 93-94
PC Speaker sound, 386
percussion sounds, 101
pitch, 95, 311
reverberation, 126
roll-off frequencies, 98, 119
signals, 94
signal-to-noise (s/n) ratio, 99
sine waves, 94
sound card bandwidth, 98
system bandwidth, 99
timbre, 101, 115
total harmonic distortion (THD), 99-100, 313
types of, 100, 209, 385-386
waveforms, 93-94, 114-118
waveguide synthesis, 124-125

wavetable synthesis, 24, 25, 102-103, 131-132
See also Audio technologies; File formats; FM synthesis; Frequency
Sound Blaster sound card, 9-10, 21-22
drivers for, 66, 409
port addresses and, 55
Sound Blaster 16 ASP sound card, 24-25
Sound Blaster Pro sound card, 20
Sound Blaster emulation, 67, 69-70, 85, 390, 391-392
Sound Blaster games, 407
Sound Blaster instrument bank files (.IBK), 109
Sound Blaster Instrument files (.SBI), 109
Sound Blaster-compatible audio processor, 42, 48, 52, 55, 56
Sound blocks
file formats and, 108, 109, 110, 111
silence blocks, 121
Sound cards
AdLib sound card, 8-9
bandwidth and, 98-99
Board ID jumpers for, 37-38
configuring on the fly, 70
early history of, 6-10
game software and, 6, 8-9, 20-21, 40
history of, 6-28
Media Vision 16-bit sound cards, 368-373
MIDI standards and, 6-8
sales of, 4-5
slots and connectors, 43-44, 45
uses for, 6
See also 8-bit sound cards; 16-bit sound cards; Media Vision products; *all Pro Audio sound card entries*
Sound effects. *See* Special effects
Sound enhancement circuits, 313-314
Sound Factory programming tools, 255-256
Sound files
inserting in word processor documents, 140-141
playing from AUTOEXEC.BAT, 134
See also File formats
Sound Impressions program, 137-139
Sound quality
of CD-ROM drives, 100
of digital audio, 105, 106
of speakers, 310-313
of synthesizers, 174
Sound Resource files (.SND), 110, 248
Sound technologies. *See* Audio technologies
SoundSculptor software, 250
Space Quest CD-ROM title, 258
Space Shuttle CD-ROM title, 258-259
Speaker Out connector, 34, 336
Speakers, 308-336, 386
AC and DC adapters, 316
Acoustic Research speakers, 320-321, 324-325, 329-331, 335
Altec Lansing speakers, 325-326, 331-332, 333-334, 335
bandwidth and, 99
Bose speakers, 332-333, 335
cables, 316, 336
distortion levels, 313
expensive (over $300), 328-334
external connectors for, 34
floppy disks and, 316
frequency response specifications, 311-312
full range ($150 to $300), 324-328
game software and, 317-318
versus headphones, 308
headphones output, 315
impedance (ohms), 309-310
Koss speakers, 318-319, 321, 335
Labtec speakers, 318-319, 322, 335
low-priced (under $50), 318-319
magnetic shielding, 315-316
medium-priced ($50 to $150), 320-324
monitors and, 315-316
multiple inputs and outputs, 315
overview of, 308-309
PC Speaker sound, 386

Persona Technologies speakers, 323, 326-327, 335
power output, 312-313
powered versus unpowered, 309-310, 336
power-saving circuits, 317-318
purchasing, 318, 334-335
Radio Shack speakers, 318-319
satellite speakers, 328
sensitivity of, 312
setting up and positioning, 335-336
size and appearance of, 317
Sony speakers, 323-324, 327-328, 335
sound enhancement circuits, 313-314
sound quality of, 310-313
specifications for, 311
stereo effect, 313
subwoofers, 328, 333-334
supported, 386
volume, balance, and tone controls, 314-315
wattage, 309-310, 312-313
Special effects
CD-ROM titles and, 206
digital signal processing (DSP) and, 125-126
EZSound FX software, 248-249
Mr. Sound FX software, 250
Spectrum CODEC chip set, 39-40, 42
Spectrum Holobyte, Falcon 3.0 game, 220, 221, 408
Speech
digital signal processing (DSP) and, 125, 126, 162
waveforms of, 115
waveguide synthesis and, 125
Speech recognition software, 152-163
background noise and, 153, 162
command and control software, 152-153
continuous speech systems, 162-163
digital signal processing (DSP) and, 125, 126, 162
future of, 162-163
IBM VoiceType Control program, 160
machine dictation software, 152, 153, 162
microphones and, 337
technology of, 153-154, 161-162
Voice Blaster program, 160-161
See also ExecuVoice program; InCube Voice Command software
Speech synthesis software. *See* Monologue
Speed
bus speed (megahertz), 43
of CD-ROM drives, 271-275
compression speed, 123
of floppy disks, 272
of hard disk drives, 272
speed-compensating joystick cards, 356, 361-362
speeding up CD-ROM titles, 205-206
Sports games
control pads for, 356-358
overview of, 223-225
SSI, Flashback, 222
Standard MIDI File Specification, 183
Star Trek: The 25th Anniversary game, 409
Star Trek: The Screen Saver, 248
Stereo effect, of speakers, 313
Stereo enhancement feature, 41
Stereo Line-In connector, 35, 386
Stereo Line-Out connector, 34, 336, 386
Storage. *See* Hard disk drives; Memory
Strategy games, 225-226
Strike Commander game, 221
Studio files (.SNG), 110, 183
Studio for Windows software, 230-231
Subwoofer speakers, 328, 333-334
Suncom Command Control, 358, 362
SuperJAM! software, 226-227
Synthesized sound, 385
See also FM synthesis; Waveguide synthesis; Wavetable synthesis
Synthesizers, 174-176
base-level versus extended-level, 184-185
keyboard synthesizers, 166
melody channels, 175-176
MIDI channel numbers and, 173

MIDI Mapper applet and, 183, 184, 185-186
MidiKeys program, 448-450, 455
MPC standard for, 175, 184-185
multi-timbral, 175
non-General MIDI synthesizers, 183, 184, 185
patch assignments, 175
percussion (drum) channel, 176
polyphony and, 175-176, 184-185
sound quality of, 174
See also FM synthesizers; MIDI sequencers
System bandwidth, 99
System freezes
INSTALL and, 392
Monologue and, 399
Quick Start and, 64
SYSTEM.INI settings, 77, 79-81, 402

T

Talking Slideshow software, 440, 452-453, 455
Tape drives, 50, 421
TBCONFIG.EXE program, 132
TBPRO.ZIP file, 132
See also TrakBlaster Pro program
Technical Support
before calling, 387
for CD-ROM drives, 282, 386
Media Vision, 32, 208, 384-385
See also Bulletin board systems; Troubleshooting
Telephone numbers
for CD-ROM drive and software vendors, 294-295
for CD-ROM publishers, 211-213
Media Vision, 32, 366, 367, 384
for software publishers, 260-262, 454-456
TEMP directory, 207-208
Templates, speech recognition, 153-154, 161-162
Terminate and stay resident (TSR) programs
driver software, 63
Musicbox, 132-133
Terminators, SCSI, 417-418
Testing
CD-ROM drives, 299
MPC standards and, 279
Texel CD-ROM drives, 275, 291-292, 294
Text editor, DOS, 65
Text-to-speech synthesizer. *See* Monologue
THD (total harmonic distortion), 99-100, 313
THE Audio Solution, DigPak and MidPak, 253, 262
Three-dimensional graphics cards, 24, 27
Throttle controls, 341
THRU MIDI sockets, 170
ThrustMaster, 346-355, 361-362
ACM joystick card, 361-362
Flight Control System (FCS), 347-349
Mark II Weapons Control System (WCS), 349-351, 360
Rudder Control System (RCS), 351-352
Thunder & Lightning sound card, 48, 49, 376-378
Thunder Board sound card, 376-378
developer's kit, 431
DMA settings for, 48, 49
FM synthesizer on, 101
history of, 20-21
IRQ settings for, 53
sample size and, 106
Voice Blaster and, 161
Timbre, 101, 115, 175
Timer parameters, MVSOUND.SYS, 68
Toshiba CD-ROM drives, 275, 292-293, 294
Total harmonic distortion (THD), 99-100, 313
TPCM software, 135, 460-461, 466-471, 473-474

TrakBlaster Pro program, 109-110, 131-132, 399
Transfer rate, CD-ROM drive, 272-273
Trantor Systems, SCSIworks!, 276, 420-423
Trax MIDI sequencer, 25, 234
Treble controls, 41
Trilobyte, 7th Guest, 199-201, 213, 257, 375
Trim controls, for joysticks, 342
Troubleshooting, 384-411
  7th Guest, 201
  abbreviations and definitions for, 385-386
  Arthur's Teacher Trouble, 192-193
  Battle Chess Enhanced CD-ROM, 199
  CD-ROM titles, 208-211, 406
  Civilization, 202
  Compton's Interactive Encyclopedia, 196, 406
  Disney Software games, 408
  DMA settings, 389-392, 395, 399, 402
  F1-17 game, 410
  Falcon 3.0 game, 408
  game software, 404, 407-410
  generic CONFIG.SYS and AUTOEXEC.BAT for, 388, 389
  Gunship 2000 game, 410
  hard drive noises, 411
  I/O port address map for, 390
  installation floppy disks, 64
  IRQ settings, 389-392, 395, 399, 402
  joysticks, 360-362, 407
  King's Quest V game, 410
  Lawrence Productions games, 409
  LHX game, 409
  Links, The Golf Game, 408
  Lotus 1-2-3 for Windows with Multimedia Help, 400
  Mantis Experimental Fighter, 201
  Mayo Clinic Family Health Book, 194-195
  Microsoft Bookshelf program, 406
  .MID files, 398
  Monologue programs, 399-400
  MSCDEX.EXE CD-ROM driver, 394-397
  MVSOUND.SYS driver, 393-394, 398, 402
  PAS.EXE mixer program, 405
  PC Karaoke, 198
  Playfile program, 405-406
  Pocket CD program, 136
  Pocket Mixer program (PMIX.EXE), 402
  Pocket Recorder, 402, 403-404
  President's Starting with George program, 406
  Pro AudioSpectrum 16 hardware installation, 391-392
  Pro AudioSpectrum 16 software installation, 392-394
  Pro Mixer program (PROMIX.EXE), 402
  Recfile program, 404, 405-406
  recording, 402-403
  Robin Hood, The Legend of the Long Bow game, 409
  .ROL files, 398
  SCSI interface, 394-397
  Sequencer Plus program, 398-399
  Sherlock Holmes game, 410
  Sound Blaster games, 407
  Sound Impressions program, 139
  standard troubleshooting steps, 388
  Star Trek: The 25th Anniversary game, 409
  stereo Studio FX, 398
  technical information for, 385-388
  TrakBlaster Pro, 132, 399
  TSLCDR.SYS CD-ROM driver, 394-397
  Ultima Underworld game, 409
  Where in the World Is Carmen Sandiego?, 192
  Windows driver software, 401-404
  Wing Commander, 408
  Wolfenstein 3D game, 410
  See also Technical Support
TSCSI directory, 297

TSLCDR.SYS CD-ROM driver, 297-302, 394-397
TSRs
  driver software, 63
  Musicbox, 132-133
Turtle Beach Systems, .SMP files, 110
Twelve Tone Systems, Cakewalk Professional, 237-238, 262

U

Unamplified signals, 34
Unpowered speakers, 309-310, 336
Upgrade policies, for CD-ROM drives, 282
Upper memory, installation and, 55-56
Utility software, 246-252
  After Dark, 247-248
  AudioView, 250-251
  Blaster Master, 248
  EZSound FX, 248-249
  Mr. Sound FX, 250
  Multimedia Toolkit, 251
  PatchView FM, 252
  SoundSculptor, 250
  Star Trek: The Screen Saver, 248
  Whoop It Up!, 246-247, 260, 440, 453-454, 456
  Wired for Sound Pro, 247
  See also DOS software; Microsoft Windows software; Programming tools
Utility software on book's diskette, 460-474
  accessing, 462
  CmpWav, 460, 463-466
  documentation for, 461
  PCMFun, 460-461, 471-474
  syntax for, 462
  TPCM, 135, 460-461, 466-471, 473-474
  See also Software on book's diskette

V

Vendors, CD-ROM drive and software, 294-295
VESA Local Bus, 45
Video cards
  CD-ROM titles and, 206
  IRQ settings for, 52
  Media Vision Video capture board, 27
  Pro Graphics 1280 accelerator, 434
  for three-dimensional and full-motion video, 24, 27
Video compression/decompression
  lossless versus lossy compression techniques, 123-124
  software, 26
  See also Audio compression/decompression
Video drivers, CD-ROM titles and, 209
Video Electronics Standards Association (VESA), 45
Virgin Games
  7th Guest, 199-201, 213, 257, 375
  11th Hour, 200
  address, 213
  Lands of Lure, 200
Virtual Pilot joystick, 344-346
Virtual reality, joysticks and, 359-360
Viruses, CD-ROM drives and, 268
VL-Bus, 45
Voice Blaster program, 160-161
Voice commands. *See* ExecuVoice program; InCube Voice Command software; Speech; Speech recognition software
Voice files (.VOC), 111, 121, 134, 135, 248, 250
Voices
  male opera singing voice, 116
  melodic and percussion, 175-176
  See also Speech
VoiceType Control program, 160

Volume control
hot keys for, 65, 87
overview of, 31-32
See also Mixer programs
Voyetra Technologies
address, 262
AudioView, 250-251
Multimedia Toolkit, 251
MusiClips, 256
PatchView FM, 252
Sequencer Plus series, 110, 238
Sound Factory, 255-256

W

Warranties, CD-ROM drive, 282
Wattage, of speakers, 309-310, 312-313
Wave Editor, Sound Impressions, 138, 139
Wave files (.WAV), 110, 111
AudioView software and, 250
Blaster Master and, 248
CmpWav compression software, 460, 463-466
Media Player and, 139
MIDI Jukebox and, 450-451
Recfile program and, 135
sampling rate and, 134
Whoop It Up! software and, 246-247, 260, 440, 453-454, 456
Waveform editors, defined, 39
Waveforms, 114-118
algorithms for, 117-118
defined, 93-94
equalization and, 116-118
Fourier analysis of, 115-118
of male opera singing voice, 116
of musical instruments, 114-115
rainbows and, 118
of speech, 115
Waveguide synthesis, 124-125
See also FM synthesis; Wavetable synthesis
Waves
characteristics of, 93-94
complex waveforms and, 115-118
sine waves, 94, 115-118
Wavetable synthesis
versus MOD players, 131-132
overview of, 24, 25, 102-103
See also FM synthesis; Waveguide synthesis
Where in the World Is Carmen Sandiego?, 191-192, 375
Whoop It Up! software, 246-247, 260, 440, 453-454, 456
Wide SCSI-2 standard, 416
WIN.INI settings, 77, 81
Windows. *See* Microsoft Windows
Wing Commander game, 21, 408
WinJammer MIDI sequencer, 238-239, 262
WinSong software, 236
Wired for Sound Pro software, 247
Wolfenstein 3D game, 222, 410

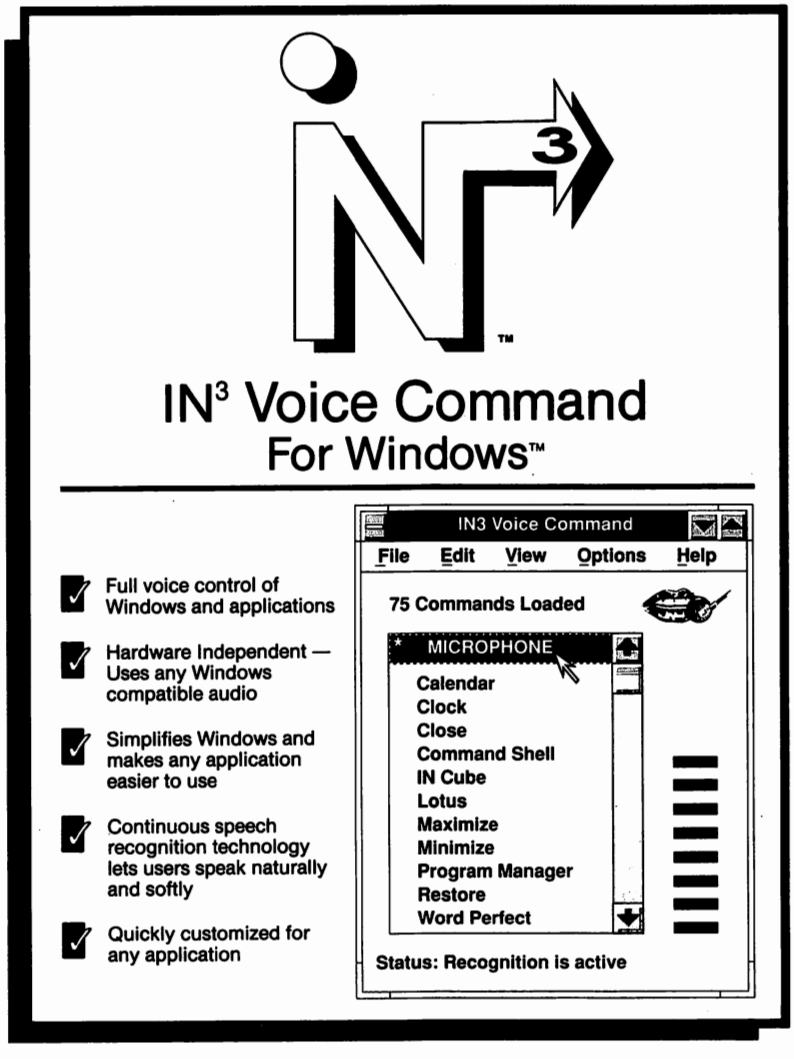
X

X-Wing game, 222

Y

Yamaha FM synthesizer chip, 40, 101-102, 109
See also FM synthesis; FM synthesizers

Special Edition Enclosed!



IN³ Voice Command
For Windows™

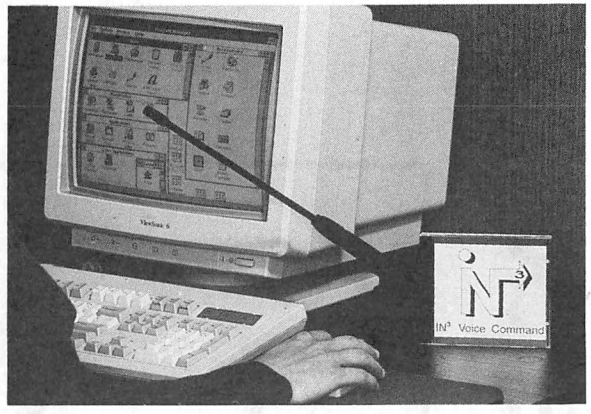
- Full voice control of Windows and applications
- Hardware Independent — Uses any Windows compatible audio
- Simplifies Windows and makes any application easier to use
- Continuous speech recognition technology lets users speak naturally and softly
- Quickly customized for any application

Order the Registered Version of IN³ Voice Command Today and Save $30!

- Add Your Own Commands
- Use With All Windows Applications

Save $30 on IN³ Voice Command

The One That Works!



YES! Please rush **IN³ Voice Command** For Windows to me today for only $149.00* ($30 savings) plus shipping ($7.50 - 2nd day UPS in U.S.) per copy.

☐ My check is enclosed for $ _____

☐ Please bill my MasterCard or VISA for $ _____

Card # _____ Exp. Date _____

SHIPPING ADDRESS:
(UPS Will Not Deliver to P.O. Box)

Name _____

Company _____

Mail Stop _____

Address _____

City/State/Zip _____

Phone ( ) _____ Ext. _____

* Limited time offer.
IN³ is a trademark of Command Corp. Inc.

PAS-TOB1

TALKING SLIDESHOW

To Order Talking Slideshow complete this form:

How are you paying? (please check one)

__ Check (U.S. Funds) __ Money Order __ Visa __ Mastercard

Please complete the following:

Your Name:
Company:
Street:
City: State: Zip Code:
Your Phone #:(_ _ _) _ _ _ - _ _ _ _

Visa/Mastercard Number _ _ _ _ - _ _ _ _ - _ _ _ _ - _ _ _ _
Expires: _ _/_ _

Cardholder Signature: _____

Phone Orders: Call (206) 861-5463 (Visa/MasterCard only)

Please specify diskette size (check one) ____5 1/4" or ___ or 3 1/2"

Compute Your Payment:

(1) Registration for Talking Slideshow is $ 9.95 _____

(2) Washington State residents add 8.2% sales tax (x .082) _____

(3) Add shipping and handling:

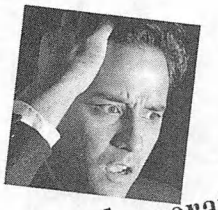
US = $4.00
Canada = $6.00
International = $11.00 S & H _____

TOTAL $_____

Mail this form together with payment to:

Softline, Inc.
ATTN: Order Desk
15377 N. E. 90th
Redmond, WA 98052

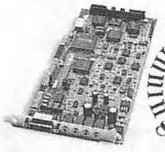
Please allow 2 - 3 weeks for delivery



In desperation I asked my friend about Multimedia. She said it's simple. To turn your computer into a multimedia funhouse you need an award-winning Pro AudioSpectrum™16 sound card. Sounds great I said. But she wasn't done. I should also get a great CD-ROM drive and a pair of amplified speakers so I can walk through the jungle, talk to Columbus or even explore a haunted house. And all this stuff should be easy to use and set up in my computer automatically. So I asked—where the heck am I going to find all this in one affordable package?

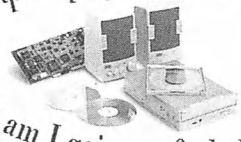














MEDIA VISION

PC Magazine Editors' Choice

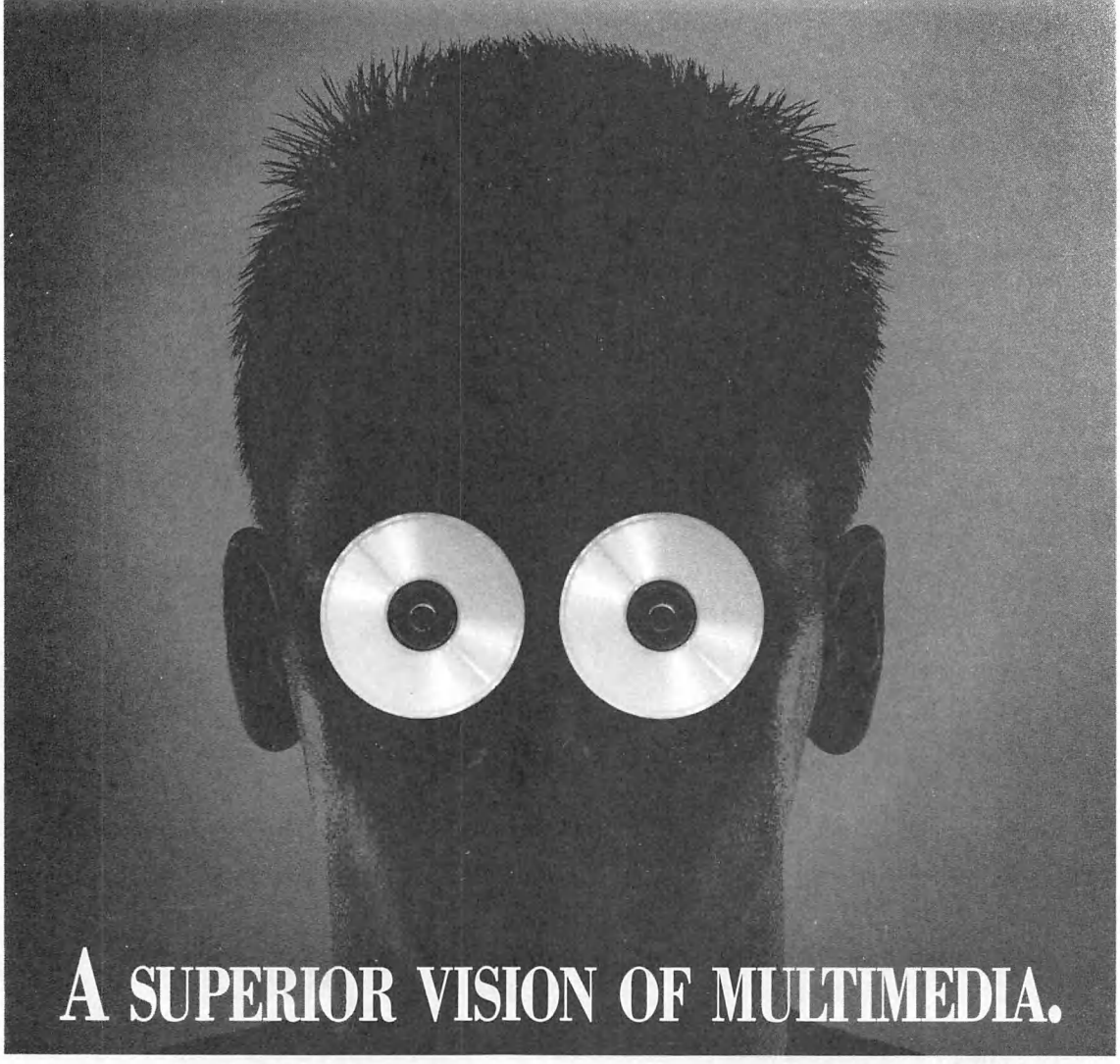
PC2 Multimedia PC

Microsoft Windows Compatible

NOW THAT'S MULTIMEDIA!

Fusion DoubleCD™ 16 — The Complete Multimedia Kit.

Call 1-800-845-5870 for information or a dealer near you. © 1993 Media Vision, Inc., 47300 Bayside Parkway, Fremont, CA 94538. (510) 770-8600. Fax: (510) 770-9592. Pro AudioSpectrum and Fusion DoubleCD 16 are trademarks of Media Vision, Inc. Any other trademarks are owned by their respective holders. Any and all bundled software subject to change without notice.



Introducing the 250ms Double-speed Pro 16 Multimedia Upgrade System II.

Looking for the ultimate multimedia experience? Why saddle yourself with a system that's strictly amateur? For an upgrade without equal, accept nothing less than the Pro 16 Multimedia System™ II.

This state-of-the-art MPC2 ready enhancement for your PC combines NEC's fastest double-speed CD-ROM drive at 300kB/sec and a blazing 250ms access time, with Pro AudioStudio™ 16, the world's best-selling 16-bit, CD-quality, sound card. So whether you're enjoying an interactive CD software title, or navigating through your PC with the included Voice Recognition software — you experience the acoustics of the top 16-bit sound product in the industry. Just ask PC Magazine, who awarded us an Editors' Choice Award for best PC Sound. And it's fully Kodak Photo CD compatible. Plus, you'll find eight of the best-selling CD program titles included in the Pro 16 System. Including Compton's Interactive Encyclopedia. Mayo Clinic Family Health Book. Carmen Sandiego Deluxe. Mantis Experimental Fighter. Civilization. Battle Chess Enhanced. Macromedia's Action! And PC Karaoke.



Purchasing all this separately would set you back twice what Pro 16 costs. Which makes it the best multimedia kit, and the best value.

So for uncompromising quality and performance, insist on the Pro 16 Multimedia System II. Now occupying the top shelf at your local computer dealer.

MEDIA VISION

Call 1-800-845-5870 for information or a dealer near you. © 1993 Media Vision, Inc., 3185 Laurelview Court, Fremont, CA 94538. (510) 770-8600. Fax: (510) 770-9592. Pro AudioStudio and Pro 16 Multimedia System are trademarks of Media Vision, Inc. Any other trademarks are owned by their respective holders. Any and all bundled software subject to change without notice.



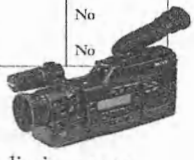
NOW THEY TELL YOU THERE'S NOT ENOUGH HARD DISK SPACE.

You've just captured the world's most phenomenal video footage. Problem is, with most PC motion video cards, you need a monster-sized drive to store it. But now Pro MovieStudio™ has a legendary new solution: real time compression.



Which means no "Disk Full" errors. No RAM limitations or delays. Just instant, TV-quality, full-color video. 30 frames/second motion in 160 x 120 windows, and 15 frames/second in 320 x 240 windows. Perfect for spicing up multimedia programs, training videos or presentations. From any video source — camcorder, VCR, laserdisc — in NTSC, PAL or SECAM. Capture dramatic footage, then use the Advanced Imaging Control to make videos look their best. Also, you have plenty of disk space for all the great software you get with Pro MovieStudio. Like Microsoft® Video for Windows.™ Macromedia's® Authorware Star™ for professional quality videos. An AVI®-to-QuickTime® converter. And a DOS player/recorder, to broadcast your work to the widest possible audience. No other PC video card can prove such a claim. Plus, Pro MovieStudio is easy to install, and it works with any VGA card. So don't miss your chance to create a splash with full-color, full-motion PC video. Visit your nearest Media Vision dealer or call us today. We'll take the mystery out of PC video.

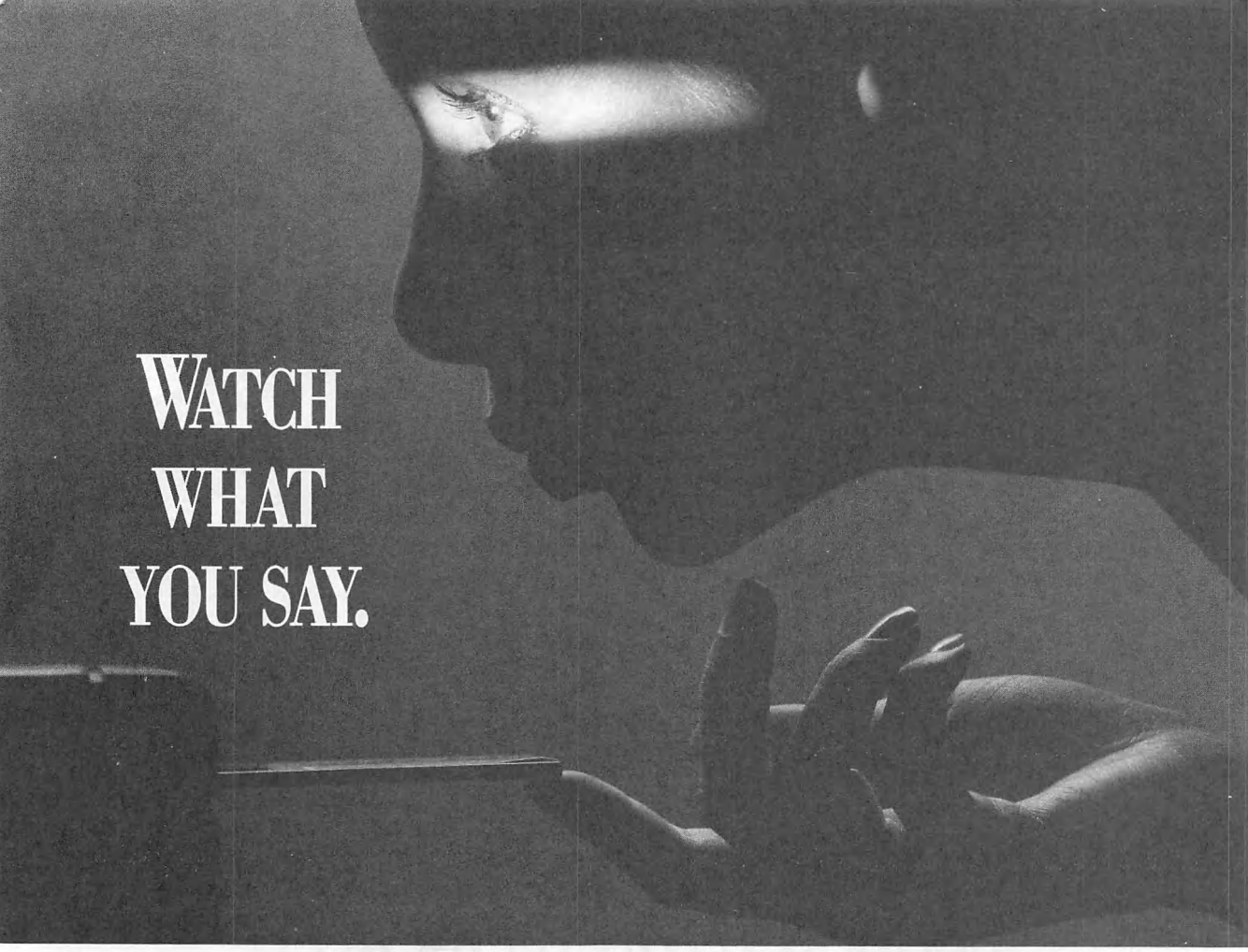
Comparison Chart	Pro MovieStudio	VideoSpigot™
Real Time Compression	Yes	No
DOS Player	Yes	No
AVI/QuickTime Converter	Yes	No
Advanced Image Control	Yes	No



MICROSOFT WINDOWS COMPATIBLE

MEDIA VISION

Call 1-800-845-5870 for information or a dealer near you.© 1993 Media Vision, Inc., 3185 Laurelview Court, Fremont, CA 94538. (510) 770-8600. Fax: (510) 770-9592.
Pro MovieStudio is a trademark of Media Vision, Inc. Any other trademarks and registered trademarks are owned by their respective holders.



Introducing the Pro AudioStudio 16 with voice recognition. From the world leader in 16-bit sound.

Your computer is listening. And responding. Because now, Media Vision is delivering the world's most advanced 16-bit sound solution — with voice recognition — for your PC. It's the Pro AudioStudio™ 16. Providing the CD-quality, 16-bit digital audio that has earned Media Vision PC Magazine's Editors' Choice Award for best PC Sound. And a whole lot more.



Pro AudioStudio 16 comes complete with the Pro AudioSpectrum™ 16 sound card, a microphone and Windows™ compatible software, including sound editor, 16-bit text to speech synthesizer, mixer and audio compression and decompression. And QuickStart® installation software makes Pro AudioStudio 16 easy to set up. Plus, it's 100% compatible with MPC, MPC2, AdLib™ and SoundBlaster™ cards.

You can be sure you're getting the best. Because it's from Media Vision, the most trusted name in 16-bit sound. In fact, more major PC manufacturers use Media Vision than any other sound solution.

So if your reasoning is sound, voice your preference for Pro AudioStudio 16. It'll change your vision of 16-bit sound.

PC MAGAZINE EDITORS' CHOICE April 27 1993 Pro AudioSpectrum 16

PC MAGAZINE TECHNICAL EXCELLENCE AWARD 200 WORLDWIDE

PC Multimedia PC

PC2 Multimedia PC

MICROSOFT WINDOWS COMPATIBLE

MEDIA VISION

Call 1-800-845-5870 for information or a dealer near you. ©1993 Media Vision, Inc., 3185 Laurelview Court, Fremont, CA 94538. (510) 770-8600. Fax: (510) 770-9592.
Pro AudioStudio and Pro AudioSpectrum are trademarks of Media Vision, Inc. All other trademarks are owned by their respective companies.

Keep Me Up to Date!

❒ YES, Send me a FREE copy of Osborne's computer book newsletter. To receive the newsletter, please fill in last 4 digits of ISBN number above the bar code on the back of book 0-07-881 _ _ _ - _

Name: _____ Title: _____

Company: _____

Address: _____

City: _____ State: _____ Zip: _____

Tel: _____ Fax: _____

❒ I took this postcard out of an Osborne book titled: _____

I use the following Software (check all that apply)

❒ MS Word for Windows (1900)
❒ WordPerfect (1901)
❒ WordPerfect for Windows (1902)
❒ Ami Pro (1903)
❒ Other word proc. software (1904)

❒ FoxPro (1905)
❒ dBASE (1906)
❒ Paradox (1907)
❒ Microsoft Access (1908)
❒ Other database software (1909)

❒ Lotus 1-2-3 (1910)
❒ Excel (1911)
❒ Quattro Pro (1912)
❒ Quicken (1913)
❒ Other spreadsheet software (1914)

I use this operating system

❒ DOS (1915)
❒ Windows (1916)
❒ UNIX (1917)
❒ Macintosh (1918)
❒ Others (1919)

I program in

❒ C (1920)
❒ C++ (1921)
❒ Basic (1922)
❒ Pascal (1923)
❒ Others (1924)

I also use

❒ NOVELL Netware (1925)
❒ Other Network (1926)

❒ Multimedia (1927)
❒ Comm/Online Software (1928)
❒ Desktop Publishing (1929)

❒ YES! Please notify me if Osborne has any special discounts on computer books.

❒ YES! Please send me information on new books by fax.

Comments _____

Place
First Class
Stamp
Here



Osborne/McGraw-Hill

Blue Ridge Summit, PA 17294-0840

U.S.A



369 PA Spectrum vs PA Studio boards vs PAS/16XL
86 midi map
398 midimate has opto isolator



About the Authors...

Ivan Luk, co-author of the best-selling **Sound Blaster: The Official Book**, is a full-time network administrator. He is also a consultant and beta tester for various hardware and software companies. As an avid computer gamer and amateur musician, he has amassed many years of experience with sound cards since their introduction on the PC.

David M. Golden, co-author of the best-selling **Sound Blaster: The Official Book**, is an independent consultant and author residing in San Francisco. He is currently involved with the development of a number of database and multimedia projects.

Covers the Pro AudioSpectrum 16, Pro AudioStudio 16 and 16XL, and Media Vision Multimedia Upgrade Kits: Pro 16 Multimedia System II, Fusion Double CD 16, and Fusion CD 16

Skill Level Guide

- ☐ Beginner
- ☐ Intermediate
- ☐ Advanced
- ☒ For Every User

The Only Official Book

MEDIA VISION

Get the Insider's Edge!

THE FIRST AND ONLY OFFICIAL BOOK ON PRO AUDIO 16 SOUND CARDS

Sound will take on a whole new meaning when you discover the incredible range of music, weird noises, and special effects that you can produce with the Pro Audio 16 sound cards. This **official** Pro Audio 16 book shows you how to orchestrate masterful performances, no matter what your level of experience is with these cards. Everything you need to know is here — from troubleshooting your installation to commanding all aspects of the Pro Audio 16 software. You'll find:



- An overview of the Pro Audio 16 family complete with details about the 16-bit sound products
- Operating instructions and hot tips for making the most of the bundled software that comes with the Pro Audio 16 family of sound cards
- One 3.5-inch diskette loaded with software that will make your Pro Audio 16 card do tricks you never thought possible
- A survey of selected CD-ROM drives, speakers, joysticks, and software for the Pro Audio 16 cards, together with buying tips you won't want to be without
- Complete instructions for hardware and software installation, including the Windows drivers, so you'll get up and running fast
- Troubleshooting tips and techniques that show you how to solve interrupt conflicts, joystick problems, compatibility problems and more

Pro Audio 16: The Official Book will throw open the door to a world of new sounds and unlimited potential for your Pro Audio 16 sound card. Drive your friends and family nuts with all the wild things you'll be able to do with your Pro Audio 16 sound card and this book in hand!

Covers the Pro AudioSpectrum 16, Pro AudioStudio 16 and 16XL, and Media Vision Multimedia Upgrade Kits: Pro 16 Multimedia System II, Fusion Double CD 16, and Fusion CD 16

Osborne
Get Answers—Get Osborne
For Accuracy, Quality and Value

ISBN 0-07-881979-2

90000

9 780078 819797

$34.95